High Level Final Statewide Public Safety Communications Interoperability Plan

Draft Final Report

Version 2.0

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1 EXECUTIVE SUMMARY

Public Safety Communications is undergoing profound changes due to the confluence of several factors. Citizens' demands for public safety services continue to increase as does their expectations. The growing need for interoperability to meet those demands has been accelerated by the events of 9/11. Additional capacity and advanced services such as mobile data are required. At the same time, rulings on the part of the Federal Communications Commission are forcing the obsolescence of certain widely used radios. As this market is redefined, both the vendor environment and the technological choices are rapidly expanding.

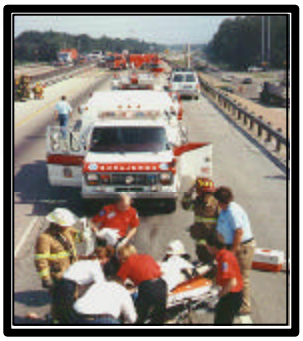
Public safety communications is, therefore, an evolving picture. Government decision makers need information on a continuing basis. In the short term, data is required for legislative actions, Federal funding opportunities, and implementation choices. In the long term, a strategy must be adopted to meets the demands of citizen in the post 9/11 environment while maximizing the return on the massive investments needed.

The purpose of this Report is to outline a high level plan for statewide communications interoperability in Washington. The primary focus is to provide a roadmap for the SIEC to utilize in the planning and implementation of public safety communications for State agencies, while providing a plan that the local/tribal agencies will find can also meet their requirements over time. The report, prepared by Federal Engineering, Inc. (***FE***), constitutes Phase 1 of a two-phase initiative to evaluate first responder communications in the State of Washington. Directed by the State Legislature for completion and delivery by December 31, 2004, this Report:

- Takes a high-level view of the current communications capabilities across the State.
- Summarizes the current situation as articulated by State, regional, local, and tribal stakeholders during regional forum meetings and SIEC member interviews.
- Outlines overarching strategic goals.
- Discusses governance, funding, process, and technical considerations and provides recommendations for improvement in each area.
- Provides near-term actionable recommendations in support of the 2005-2006 Biennium.
- Supplies background information with respect to emerging technologies, funding, and governance issues considered and/or implemented by other States.

This Report is intended to provide short term, high impact recommendations. It has been compiled in parallel with a much larger, ten month planning initiative that will articulate more specific goals and recommendations to further a higher level of statewide communications interoperability between first responders. The output of this ten-month initiative will be delivered in May 2005.

1.1 The Need for Change



Today more than ever, the requirement for communications interoperability between Federal, State, and local government public safety agencies plays a significant role in the implementation of new technology solutions. Without a collaborative approach across the State that ensures close coordination as systems evolve, communications between agencies will not approach a level that could be reasonably defined as interoperable.

First responders must be able to adequately communicate with themselves and other agencies and jurisdictions. Inadequate communications systems lead to lost situational awareness, which contributes to delays in response and recovery. Delaying first responder services leads to lost lives and property.

History has proven that turf and territory issues necessitate decision-making action by a governing body, or improvements will be extremely slow in coming. Best of breed systems, solutions, and standards are only as good as the effectiveness they bring to user agencies. Interoperable communications is merely a buzz-phrase in the post-9-11 lexicon of homeland security language if there are no governing bodies to consolidate ideas, set directions, and guide participants.

The history of first responder operations across the State of Washington, like everywhere else across the country, has been one of unique missions, requiring unique systems, using unique language, and operating under unique procedures. In today's world of consolidated, collaborative approach to public safety operations, uniqueness can no longer be defined by independence. Decades of divergence across the State must now give way to accelerated convergence. Iterative change is critical to make that turn. In addition, convergence is driven further by current Federal funding initiatives which favor a collaborative approach to interoperability.

Divergence in radio equipment, technology, frequencies, standards, backbones, operating procedures, training, response priorities, even the terms and language used during emergency operations can cause inefficiencies in first responder

operations. We have identified many "best practices" across the State. Lessons learned can be a valuable source of operational efficiency and cost reduction.

As a nationally recognized best practice, Washington's Statewide Interoperability Executive Committee (SIEC) has taken early action to address statewide interoperability by developing the critical underpinnings of an effective organization. These include statements of Vision and Mission, an ongoing meeting schedule with prepared agendas, a well-defined membership, and a set of guiding principles (see Appendix 9). Washington must continue to build on its initial efforts to provide effective planning, proactive leadership, ongoing involvement, deliberate communications, and a concentrated focus on managing the changes that will be necessary. In so doing, it is our belief that there is an excellent probability of success in both the planning and implementation processes that lie ahead.

1.2 Key Findings

Recent actions by stakeholders at all levels to improve coordination exemplifies the commitment that Washington first responder agencies have made to the improvement of public safety through enhanced communications. Senior public safety leaders throughout the state are mobilizing to improve cooperative collaboration. Some excellent efforts directed at improving regional interoperability have begun and are having good results. Despite these efforts, however, funding, technology, standards, operations, and proprietary perspectives remain obstacles to achieving full statewide interoperability. Analysis of the information and data gathered from Washington stakeholders in the course of preparing this report indicate the following:

- The majority of local public safety responders are not able to communicate effectively or directly with their Federal, State, regional, local, or tribal counterparts.

- Most organizations at both the local and State levels, do not have adequate radio spectrum or equipment to perform their critical duties.

- There is a lack of financial resources to support the vision of interoperability. Inconsistent funding streams, not only for equipment purchases, but also implementation, training, maintenance, and operations, are hampering the ability to coordinate strategic planning efforts.

- There is a lack of local, regional, and State coordination of procurement initiatives, funding availability, operations (beyond day-to-day), and standard operating procedures. While the Western States Contracting Alliance (WSCA) has done an exemplary job of providing contracting

vehicles, there has been little guidance in terms of statewide standards to be followed.

- There are technical barriers that impede interoperability. Incompatible radio systems and equipment, along with a lack of equipment and network standards, are contributing to ineffective communications.

- There is not an overall understanding and acceptance of the need for statewide interoperability across all State and local/tribal stakeholders. This is exacerbated by a shortage of information sharing on interoperability initiatives, funding, strategies, equipment, and resources.

- There is a strong need for additional training in public safety communications capabilities across the State. Standard operating procedures related to public safety communications have not yet been fully developed for all major emergency response scenarios involving multiple jurisdictions, disciplines, and levels of Federal, State, local, and tribal governments.

These shortcomings are by no way reflective of the public safety community which has accomplished a great deal with the resources available to date. Rather, it is reflective of growing demands, a changing world, limited funding, and a method of planning that evolved at a time when interoperability was not a driving factor.

1.3 Goals

The major goals to be achieved by the overall planning efforts are both performance and user driven, and should be developed by key stakeholders, in this case, the SIEC. This was a major component of the December 1, 2004 SIEC meeting, where the SIEC finalized the planning process and achieved a consensus on the goals and strategic direction. Section 8 of this report – Goals, Recommendations, and Initiatives, provides a summary chart outlining goals and recommendations as well as high-level cost estimates for short-term recommendations. The goals adopted by the SIEC are as follows (please note that these have not yet been prioritized):

Goal 1: Establish statewide interoperability as a high priority for all stakeholders, including Federal, State, local, regional, and tribal agencies and entities.

Goal 2: Maximize the improvements in interoperability by institutionalizing collaborative approaches across the State based upon common priorities and consensus at the regional level. The Homeland Security "region" structure may

be appropriate to utilize but it is also recognized that there are other groupings of agencies and communities that may not perfectly align with the Homeland Security regions. The real issue is that planning and collaboration across any groups of agencies with common needs will be more beneficial than agencies/municipalities taking action solely on their own.

- Achieve incremental progress on a regionalized basis rather than requiring a common approach across the state.
- Maximize transferability of best practices through effective education and awareness of successes and lessons learned. Provide repeatable implementation plans in a format that can be modified and applied by local entities.
- Maximize resource and knowledge sharing.
- Provide for full participation and representation of all stakeholders in the planning and implementation of interoperability solutions.

Goal 3: Create an architectural approach establishes a framework for interfacing between disparate systems, and promotes migration to new technologies in line with relevant standards platforms. Do this by establishing a common set of standards, processes, language, and training approaches statewide that will encourage and provide incentives for the migration of technology and best processes.

- Fulfill the requirements to support emerging Federal standards for National Incident Management System (NIMS), the Department of Homeland Security (DHS), Safe Communications (SAFECOM), the Department of Justice (DOJ), Office of Domestic Preparedness (ODP), etc.).
- Support nationally sanctioned standards sponsored by Public Safety Associations such the Association of Public safety Communications Officials (APCO) and the Telecommunications Industry Association/Electronics Industries Association (TIA/EIA), and other applicable organizations.
- Seek out and leverage opportunities to participate in the development of applicable Federal standards for NIMS, DHS, SAFECOM, DOJ, and ODP.
- Utilize the standards platform as a guideline for allocation of funds.
- Provide a centralized approach for frequency management and coordination of tower/shelter information.
- Complete deployment of radio caches as outlined in the Interim Plan.

Goal 4: Migrate State agencies to a common public safety communications system.

- Maximize the sharing of infrastructure in the short term, creating a "system of systems" where possible.
- Provide regional, tribal, and local agencies the ability to participate in the State system as appropriate.
- Leverage the experience of the existing agencies to build the approach for the central management of the resource components for both the short and long term (towers, backbone, radio systems, etc.)

Goal 5: Provide for a technology environment that allows evolutionary migration of State, local, tribal, and regional systems to the level of interoperability that is appropriate for their mission.

- Maximize the use of existing mutual aid channels and appropriate gateway devices.
- Research how other States and regions are implementing statewide interoperability.
- Implement statewide VHF wideband analog coordination channels as outlined in the Interim Plan.

Goal 6: Optimize the use of all funding sources at the Federal, State, and local/tribal levels.

- Educate key local, tribal, State and Federal legislative policy-makers regarding the need for interoperable communications, in order to gain support for maximum funding opportunities.
- Raise the awareness level of the general public for the critical and urgent need for communications interoperability.
- Drive the creation of appropriate legislation to support the most likely sources of funding.
- Maximize the availability and use of Federal, State and local funds.

Goal 7: Maximize the use of "best of breed" approaches to improving interoperability.

- Leverage experiences and lessons learned by regional and local systems into repeatable practices in support of the overall statewide capabilities portfolio.

Goal 8: Create a statewide backbone capability to provide regional and local connectivity, where most appropriate.

- Provide the bandwidth and connectivity requirements for State and local agencies to participate on the statewide backbone.

- Reduce overall spending through the use of partnerships and collaboration.

1.4 Summary of Recommendations

In order for the State of Washington to achieve near and long term goals, and to improve the level of communications interoperability across the State, the following actions should be taken:

- The SIEC must lead the way by providing a vision for the future of public safety communications within the State. In addition, the SIEC must foster collaborative behaviors amongst State agencies to serve as a model for local, tribal, and other participating groups for whom interoperability is important. It is the processes and coordination between local/tribal and State agencies that will enable the largest and fastest improvements in interoperability.

- The SIEC must act on opportunities to enforce, for State agencies, the Guiding Principles that have already been developed.

- The state microwave/fiber backbone should be centrally managed as a statewide resource, rather than a series of departmental networks that are individually managed and controlled. Initially, the primary focus should be to provide connectivity for today's State networks, including Washington State Patrol (WSP), the Washington State Department of Transportation (WSDOT), the Department of Natural Resources (DNR), and the Emergency Management Division (EMD).

- The SIEC should initiate planning efforts to consolidate the existing State agency radio networks to a common infrastructure, including providing statewide mobile data capabilities, to maximize interoperability and minimize costs. This five-year effort should provide for a migration plan that ultimately achieves statewide interoperability at the level desired by statewide participants. It is important to note that any decisions on the design or technology of this common infrastructure have not been made, and should be addressed in the Tactical Implementation Plan.

- The SIEC should work with local jurisdiction to identify regional "bridging" capabilities to link disparate communications across regional operations and enhance mutual aid within the next two to three years.

- The SIEC should provide improved coverage for all licensed mutual aid channels across the state, along with the appropriate operational

procedures and coordination processes between State and local agencies.

- The SIEC should take actions now to continue to increase its overall effectiveness. These include broader committee representation, increased meeting activity, and improved communications and outreach activities. It is time for the SIEC to move ahead with more "incremental steps"[1] as it faces the next phase of interoperability improvements.

- The SIEC should develop a Funding Plan that will generate the funding required to support the one time and the recurring costs associated with improving public safety mobile radio interoperability. The State must begin the process of identifying all available funding sources across the State and develop a plan to share funding where reasonable to move local, regional, and State agencies toward the common goals.

- The SIEC should continue to evolve its current interoperability governance structure to take advantage of the benefits of economies of scale, staff consolidation, Federal funding opportunities, and centralized management.

- The SIEC should establish a full time Interoperability Coordinator. This full-time position would report to and support the efforts of the current SIEC in the areas of legislation, technology, funding, construction, and operations. This position would be in addition to the current staff support that the SIEC receives and in addition to the two resources that are planned to perform frequency management.

- As stated in the SIEC Interim Plan, effective allocation and management of the frequency spectrum is essential. Coordinating the use of existing spectrum among the State's user community, and adding to the spectrum pool when possible, will enhance interoperability. Centralizing this effort under one group, utilizing the two resources outlined in the SIEC Interim Plan, will address and improve interference issues in the field.

- The SIEC should provide support through processes, standards, and shared learning for the development of regional technology solutions that will provide for a customized approach for their intra-regional and interoperability requirements.

- The SIEC should actively monitor and move to mitigate risks that could impede Washington's interoperability efforts, with particular attention paid to funding, governance, and technology (a discussion of risks is contained in Section 8.10 – Risk Assessment).

[1] ***SIECs: STATES' MOST EFFECTIVE TOOL FOR COORDINATING INTEROPERABILITY - Washington State Case Study and Best Practices Guide,*** SAFECOM/PSWN, October 8, 2001

- The following funding requirements should be considered to support the short-term initiatives:

Initiative	Short-term Funding Estimate
Conduct meetings in other locations of the State extending beyond Olympia.	$10K for travel
Outreach Working Group activities	$20K for travel and support
Create Interoperability Coordinator position	$150K for salary/benefits/travel
Educate key State and local legislative policy-makers regarding the need for interoperable communications.	$100K for support
Raise the awareness level in the general public for the critical and urgent need for communications interoperability.	$150K for support
Establish a minimum level of technology standards in accordance with the State's interoperability strategic plan.	$50K for support
Utilize "best of breed" practices to elevate the capabilities of regional, local, and tribal agencies.	$500K for technology and trial projects
Maximize the use of existing mutual aid channels and interconnection devices such as ACU-1000s and ICRIs.	$1M for technology and process development
Establish a common statewide communications backbone.	$26M for new microwave at approximately 200 sites over the next two years

2 METHODOLOGY

This project followed an aggressive timeline that was required to develop the overall strategic plan and goals in an 8-week period in order to be able to provide information to the Legislature in early January 2005. It is intended to provide executive level guidance and will be followed by a much more detailed report in May of 2005. The methodology that was utilized in the development of this plan included the following steps, as shown below in Figure 2.1:

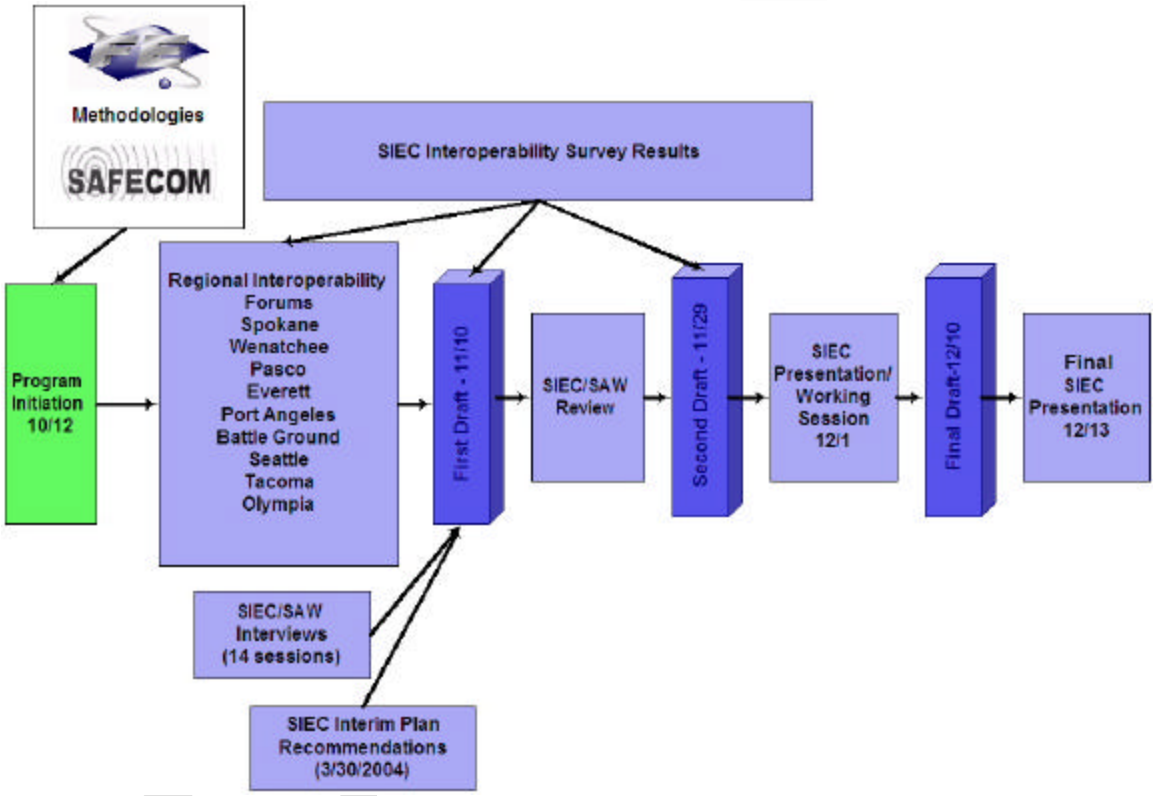


Figure 2.1 – Methodology Continuum

The primary aspects of the development of this strategic plan included the following:

- A series of interviews were conducted with SIEC members, members of the SIEC Advisory Work (SAW) Group, and additional individuals representing a diverse group of users from State, local, and tribal governments. Theses interviews were conducted with a representative from the State Department of Information Services (DIS) and Federal Engineering attending. They were designed to solicit inputs in several areas:

- Validation of the Guiding Principles that the SIEC adopted shortly after formation.
- Review of this short-term project's scope and schedule.
- Provide an opportunity to offer guidance and opinions on the technological, governance, and funding issues that the plan should address.
- Identify the critical success factors from the individual's viewpoint.
- Identify any areas that should be considered "off limits" to the study.

Discussions were lively and informative providing a good baseline of inputs from which to build the plan. Meetings were attended by a cross section of first responders, Public Safety Answering Points (PSAP) managers, vendors, hospital administrators, elected officials, tribal representatives, Federal agencies including the military, the Department of Homeland Security, the US Navy, U.S. Coast Guard, Customs Department, Boarder Patrol, Federal Bureau of Investigation and State agencies. The meetings generated a wide variety of issues and concerns across all aspects of interoperability and included discussions on day-to-day interoperability challenges, technology solutions, evolving standards, process and governance issues, strategic goals, and critical success factors.

There was a general consensus across the forums as to the areas of most concern which are further described in Section 4 – Current Initiatives. Preliminary results from the SIEC Interoperability Survey, which was developed for the Infrastructure Assessment and Tactical Planning project, were reviewed where available. Similar efforts recently completed in other States were reviewed in order to identify best current practices as well as learning from the process and technology experiences that those States have had.

FE's approach was consistent with the overall approach recommended by SAFECOM[1] in order to maintain a degree of standardization across projects as well as to ensure an ongoing linkage with similar efforts at the State and Federal levels. Key aspects of the SAFECOM methodology were followed:

1. In fiscal year 2002, as part of the President's Management Agenda, the White House established SAFECOM as the overarching umbrella program within the Federal Government to oversee all communication and interoperability initiatives and projects. The SAFECOM Program is managed within the Department of Homeland Security's Science and Technology Directorate. Through SAFECOM, the Federal Government is attempting to address public safety communications issues in a more coordinated, comprehensive and, therefore, effective way.

- Researching other interoperability initiatives.

- Engaging Focus Groups (regional interoperability forums) to ensure a broad base of involvement and input to the planning process.

- Convening a Strategic Planning session of the key stakeholders (SIEC meetings in December, 2004).

- Establishing key goals to drive the overall planning process.

- Developing initiatives and performance measures to support the goals.

Initiatives that were developed as part of the SIEC's Interim Statewide Public Safety Interoperability Plan (March 30, 2004) were reviewed to determine how those initiatives fit with the plan going forward.

A highly interactive approach was followed by ***FE***. An outline of the proposed report structure was presented to the SIEC Advisory Workgroup (SAW) on October 27, 2004. The first draft of the report was provided to the SIEC and the SAW on November 10, 2004, with a revised version (1.5) was provided on November 22, 2004. The second draft version (2.0) was reviewed with the SIEC members between November 29 and 30, 2004. The first presentation to the SIEC occurred on December 1, 2004, which also served as the Strategic Planning Session for the SIEC to reach consensus on the goals and supporting plan. The final presentation was made on December 13, 2004.

3 CURRENT SITUATION

Bringing key public safety agencies together for a common purpose is never easy. Due to varying missions and the nature of independent geographic operations, State, regional, local, and tribal first responders have primarily operated autonomously over the years. Although certain agencies have moved forward aggressively with respect to interoperability, public safety communications statewide has not kept pace with communications needs.

While there can be multiple potential alternatives to address communications interoperability issues across a State or region, there are generally three high level solutions to the problem:

1. Bring all users across the State onto a common communications network.

2. In the short term, keep current networks/systems and provide linking solutions; in the longer term, provide a path for migration to newer, more consolidated technologies and coordinated operations.

3. Continue to do the same thing; the "business as usual" option.

Each of these solutions is viable and the conditions unique to Washington were applied to select the appropriate approach.

Today, constraints on resources, funding, and time, coupled with a significantly increased possibility of a major incident, have necessitated a strategic and tactical business plan that consolidates and leverages resources, funding, capabilities, and outcomes. Multi-agency and multi-jurisdictional responses to large-scale emergencies are more likely than ever before. Joint operations with Federal responders, non-law enforcement organizations, and first responders from other States and countries are a matter of "when", not "if". The ability of first responders to work and talk together is a vital component of successful emergency management.

In Washington, there are "pockets" of excellent communications capabilities. King, Snohomish, Benton, and Clark counties, the city of Tacoma, and other agencies in the I-5 corridor, have made great progress in creating local and regional interoperability. The OPSCAN project promises to also be an excellent example of how to create interoperable communications across disparate systems. Working with the Federal Integrated Wireless Network (IWN) project, the agencies in the northwest counties, along with State Patrol, have established

another approach that could be utilized as IWN expands across the State. Further, DNR, WSDOT, Fish and Wildlife, and State Patrol are sharing infrastructure and backbone capabilities in many locations across the State. The On-Scene Command and Control System (OSCCR) promises to provide a good model of a structured approach to the use of mutual aid channels for law enforcement. The Emergency Management Division has done a good job of providing low-band communications to link all regional Emergency Operations Centers across the state.

The overall statewide situation, however, is that the majority of local public safety responders are not able to communicate effectively or directly with their State, regional, or in some cases, local counterparts. Additionally, communications between other responding agencies, Federal agencies, and non-law enforcement organizations is often not available, other than by landline telephone or cellular telephone.

Most stakeholders in the State of Washington recognize the critical need to improve communications interoperability among jurisdictions and disciplines in order to enhance the safety and security of first responders and citizens. Funding, technology, standards, operations, and proprietary perspectives remain obstacles to achieving the desired level of interoperability. However, great strides in overcoming these hurdles are being made by all participants.

Based upon interviews and regional forum meetings, the following situations were identified that support our characterization of the current situation:

- Just about every possible technology that could be used for public safety radio communications is in use somewhere in the State. Some agencies use VHF narrow band, but most use VHF wideband. Some use 800 MHz, some UHF, and others are considering 700 MHz or 4.9 GHz systems. Some use trunked, some non-trunked, some P25, others non-P25 systems. This great diversity of systems has evolved for a variety of reasons including funding, preference, reliability, coverage, or simply convenience (the effort to move forward is often a difficult, frustrating, and laborious one).

- Some regions have interoperable networks, some do not.

- Some agencies share frequency bands, others will not.

- Some agencies use mobile data systems, including Automated Vehicle Location (AVL), others do not.

- Some have commercial agreements for

infrastructure sharing, others do not.

- Some agencies have identified funding to forge ahead with new technologies while others have languished with 30-year old technology and no hope of finding the money needed to move forward.

- Some agencies have an open and collaborative mindset while others expressed concern about sharing resources and the planning process.

- Some are embracing new technology and some are skeptical and stalwart in maintaining what has worked for them for years, indicating that they will change only when mandated (and funded).

- Some define communications interoperability as using additional radios; some as sharing frequencies; some as coordinating operational procedures; others do not know. As a result, some agencies are taking a hardware approach as the solution, some a software approach, and some a "process" approach through mutual aid Memorandums of Understanding (MOU's) and others handshake agreements.

- Some agencies share resources, others do not.

There are as many strategies, plans, processes, timelines, and procurement initiatives as there are agencies across the State. The SIEC must take specific and measurable steps to change and consolidate a wide landscape of issues surrounding statewide communications capabilities. Best practices in the State are available and a committed, collaborative approach to optimizing current capabilities and technology would bring Washington to the forefront as a model for other States to follow.

4 ISSUES IDENTIFIED IN INTERVIEWS AND FORUMS

Information shared in forum meetings and interviews with SIEC and SAW Group members revealed that there are numerous technical, operational, and process issues that are currently hindering interoperability across the State. This section will summarize the most prominent roadblocks to communications interoperability as expressed by the stakeholders. Ultimately, each issue must be addressed with a viable solution strategy that will support and enhance communications connectivity across the State.

The major emergency response issues identified were:

- Coverage and capacity.
- Dispatch consolidations.
- Grant and internal funding.
- Transition planning.
- Radio programming of talkgroups and conventional frequencies.

Overall, these issues were categorized in three areas: *technical* roadblocks, including frequency management, infrastructure, capacity, coverage, modulation, lack of standards, and system migration deficiencies, *operational* roadblocks, including common operating procedures, Public Safety Answering Point (PSAP) connectivity, procurement standards, and funding shortfalls, and *process* roadblocks, including governance, consensus and collaboration, requirements planning, and lifecycle strategies issues.

Detailed comments received during interviews can be found in Appendix 2.

Technical Roadblocks

- Disparate radio systems (low-band, VHF, UHF, 800 MHz, trunked, analog, digital) do not interoperate easily if at all.
- Radio coverage and capacity is not consistent statewide or countywide (regionally).
- Statewide infrastructure is not supporting all geographic areas or county and local communications.

- Frequency management and frequency sharing is not coordinated across the State.

- Future technologies are not being coordinated between statewide agencies.

Operational Roadblocks

- Public safety responder communications interoperability is lacking in many if not most cases.

- PSAP dispatch and communications capabilities are diverse and inconsistent.

- Communication and coordination of strategies and purchases are stove-piped across agencies and regions.

- Scarce funding resources will continue to impede achieving interoperability.

Process Roadblocks

- A statewide governance plan has not been instituted.

- A consensus approach to regional and statewide issues has not been adopted.

- Coordinated requirements planning have not been conducted statewide.

- A statewide system lifecycle plan has not been instituted.

4.1 Stakeholder Regional Forum Meetings

Regional Forum meetings were conducted in each of the nine homeland security regions of Washington State (Figure 4.1) over a four-week period. DIS and ***FE*** used e-mail, U.S. postal mail, phone calls, and press releases to advise first responder agencies and interested parties of the scheduled forum meetings.

Forum meetings were structured in three sections: 1) introduction of the SIEC, its mission and responsibilities; 2) introduction of the planning effort, background information, objectives, and deliverables; and 3) facilitation of discussions with respect to current systems and brainstorming of ideas for future systems. Minutes can be found in Appendix 1.

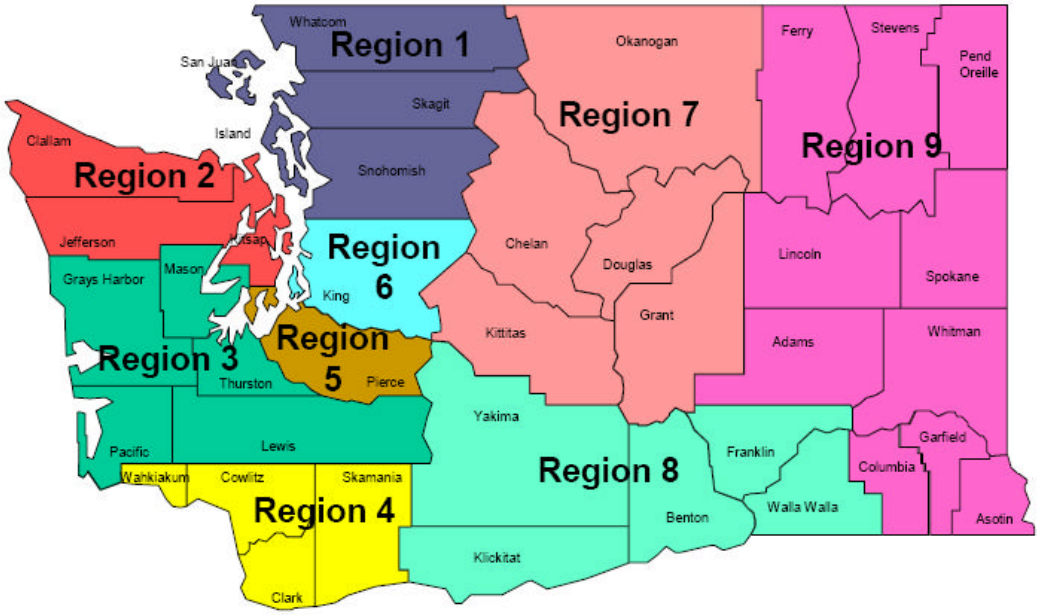


Figure 4.1 – Nine Homeland Security Regions

The objectives of Forum meetings were to:

- Introduce the Statewide Interoperability Planning project, review objectives, discuss the inventory, and brainstorm ideas regarding systems, improvements, and modifications for the future.
- Clarify the objectives for the project in terms of community needs and concerns, and the relationship of the project to any relevant strategic plans, government policy directions, and statutory or planning constraints.
- Identify feasible alternative solutions and clarify their relative merits.
- Prioritize issues and identify those key to the decision-making process.
- Identify performance objectives for key issues where possible.

General areas of discussion focused on:

- Current operational needs.
- What's working and not working today.
- Roles, responsibilities, and governance.
- Future needs.
- Potential solutions.
- How to get there.

4.2 Forum Group Participation

Due to the urgency and vital nature of this project, DIS and ***FE*** personnel set an aggressive forum schedule. All nine forum meetings were scheduled and held in

October 2004. Also, additional meetings were conducted with PSAP managers, tribal representatives, and other key public safety responder supporters. The forum schedule is shown in Table 4.1 below:

Region	Date	Location
1	October 22, 2004	Everett
2	October 21, 2004	Port Angeles
3	October 27, 2004	Olympia
4	October 18, 2004	Battle Ground
5	October 26, 2004	Tacoma
6	October 13, 2004	Seattle
7	October 6, 2004	Wenatchee
8	October 7, 2004	Pasco
9	October 5, 2004	Spokane

Table 4.1 – Forum Meeting Schedule

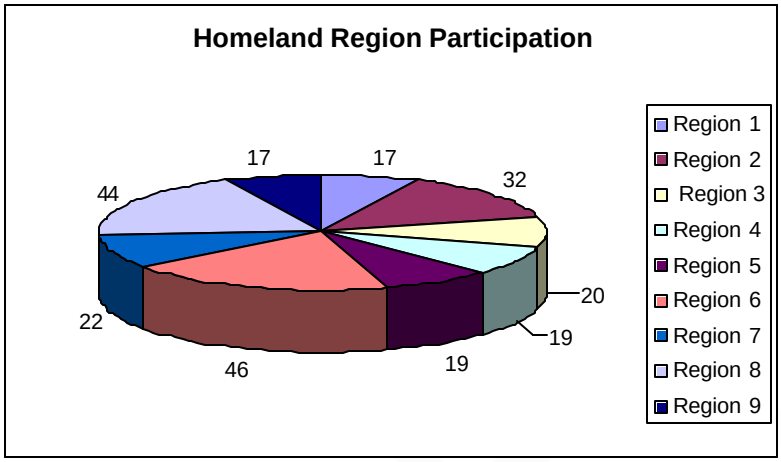
Working with DIS, ***FE*** identified the local, State, Federal, and tribal agencies and organizations who might have an interest in participating in the forum meetings. Where feasible, e-mail distribution lists were obtained or created for all interested parties.

The notification of forum meetings (and web-based interoperability survey) was a joint effort of DIS and ***FE***. To that extent the following occurred:

- Police and Sheriffs were invited via the WASPC ListServ.
- Police and Sheriffs were reminded about the meetings using e-mail addresses on WASPC ListServ.
- Invitations were sent via regular mail to police and tribal chiefs that did not have an e-mail address.
- Fire Chief and EMS organizations were invited via e-mail.
- Fire Chiefs were also sent a notification through the U.S. postal service.
- Every PSAP received multiple copies via e-mail from Bob Oenning, and the DIS/***FE*** project team.
- DIS and ***FE*** went to the PSAP meeting in Lynnwood to brief and request participation in the survey and forums.
- Specific organizations, such as USCG, FBI, USFS, DHS and others, were contacted directly by ***FE*** and DIS.

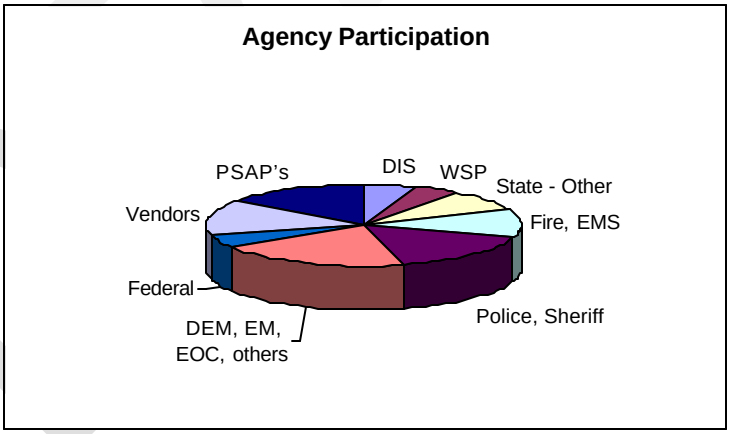
In addition to the e-mail and direct mail campaign, DIS provided press releases of the upcoming meetings.

FE and DIS met with over 200 first responders and interested parties during the four weeks of meetings and interviews, resulting in over 500 person-participation-hours (see Graph 4.1 below).



Graph 4.1 – Homeland Region Participation

The forums were attended by an excellent cross sample of first responder agencies throughout the State (see Graph 4.2 below). A list of all attendees is included in Appendix 1.



Graph 4.2 – Agency Participation

The SIEC membership was well represented at forum meetings. Seven members attended one or more meetings. They were:

- Washington State Department of Transportation, Gummada Murthy for John Conrad.
- City government (represented by the Association of Washington Cities), Alan Komenski.

- County government (represented by Washington State Association of Counties), Commissioner Mike Doherty.
- Local government fire departments (represented by the Washington State Fire Chiefs Association), Chief Jim Broman.
- Police Chiefs (represented by the Washington Association of Sheriffs and Police Chiefs), Chief Dave Stern.
- Sheriffs (represented by the Washington Association of Sheriffs and Police Chiefs), Sheriff Ken Irwin.
- Washington State Emergency Managers Association, Tom Griffith.

4.3 Key Findings of Regional Forum Meetings

Key findings are summarized in three categories: technical, governance, and funding:

Technology

Interoperability expectations issues abound at multiple levels

Some agencies were unable to communicate within their own agency. Communications with other agencies is seen as a luxury. Existing RF communications capabilities with Emergency Operations Centers (EOC's) infrastructures and between PSAP's was identified as marginal. Users are unable to communicate within and between local agencies, PSAP's, and EOC's. Interoperability expectations vary widely, based on region and available funding.

Statewide mutual aid channels are not consistently usable

Today the existing State mutual aid channels LERN (Law Enforcement Radio Network), NLEC, REDNET (Fire Service Mutual Aid Network), OSSCR (On Scene Command and Control Radio Network) and DNR (Department of Natural Resources) Common are not consistently available, HEAR, MEDNET usable, or reliable in time of need. In most situations the specific frequency is not being monitored by a dispatch center, poor coverage exists limiting usage, or the user does not know how to use, or is reluctant to use, the mutual aid channel.

The use of commercial communications systems is placing public safety agencies at risk

Many public safety agencies use one or more forms of commercial communications systems in their day-to-day operations. The most common communications is the use of cellular phones for a secondary voice communications system. The forums also identified agencies using commercial paging systems for fire station alerting, call back, and command communications. A few agencies rent tower space for critical voice communications from

commercial, non-government organizations without having a complete understanding of the security, restoration, or reliability issues related to those towers.

The first responder agencies acknowledge the risks however, the decision to use 'outside' services is driven by the higher upfront cost of providing the service themselves.

Mobile data communications is becoming more important

The importance of mobile data communications varied widely from agency to agency. The agencies without mobile data communications capabilities did not feel mobile communications is vital to interoperability operations. Larger agencies and agencies with mobile data often view mobile data communications as "mission critical." However, most agencies did agree that mobile data communications will be critical in the future as the number and capability of mobile applications continue to grow.

Governance

The State is difficult to work with

During the forums and interview process, many representatives of local government made it clear that existing regulations, domain issues, and lack of trust make it difficult to work together with State agencies.

Standards are lacking or non-existent

Agencies express interest in having technical, equipment and operational standards, while at the same time expressing concerns regarding 'dictated' or 'mandated' standards by the State.

Line "A"

Line "A" is an imaginary line (see FCC regulations for definition) south of the Canadian border with the United States (see Figure 4.1 below). All radio licenses above this imaginary line must be coordinated with Canada. Agencies impacted by Line "A" generally identified the coordination issue as a critical inhibitor in their ability to provide communications for their first responders.

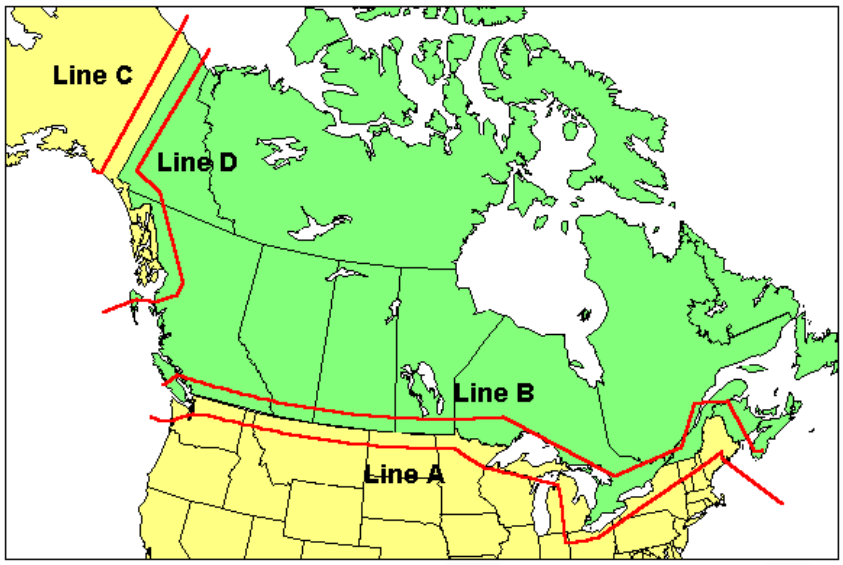


Figure 4.2 – Line A Map

Documented process, procedures and training

Users identified situations where documented processes and procedures are either lacking or do not exist. As a result, first responders are neither aware of the procedures nor comfortable in talking on another agencies' radio channels. Inconsistent channel nomenclature, language and radio codes also inhibit interoperability.

In some instances, dispatch personnel are not aware of the interoperability capabilities available to the first responders.

Funding

Funding Sources

Many agencies, especially those in the suburban and rural areas, identified the lack of stable funding sources (to procure, replace and support communications systems) as the single most important inhibiter to providing interoperable communications systems for first responders.

Some agencies went so far as to say that agencies are not currently providing adequate communications for their own first responders.

Unfunded mandates

Agencies are afraid of unfunded mandates that may be imposed by the State. Specifically mentioned were the equipment and radio system standards that are believed to be more expensive than what the agencies are using today. In most cases, this issue surfaced when the forums were discussing the digital P25

standard, which is perceived to be twice (or more) as expensive as non-P25 radios being purchased for analog VHF radio channels.

Grant Funding

Agencies recognize the limitations and weaknesses of the grant funding process. Grant funding does not provide a dependable funding source that would allow agencies to budget, plan, maintain and support a migration path for communications systems.

4.4 Conclusions

It is important to note that the above are issues as perceived by the participants and as the saying goes: "performance is interesting, perception is everything". Whether true or not, the forum participants have raised these as important issues that should be dealt with. In subsequent sections, we will make recommendations to either correct the perception if it is inaccurate, or improve the actual situation as necessary.

5 GOVERNANCE RECOMMENDATIONS

5.1 Overview

There are a multitude of Public Safety Mobile Radio (PSMR) governance processes in use today across the country at both State and local levels. After researching the most widely used models, ***FE*** has concluded that several characteristics are important for consideration:

- They are all a work in progress. Most have only been operating for a few years and are still in the stages of developing their charters and operating procedures. While some have made more progress than others, they are still learning from their early experiences and from each other.

- There is no 'best current practice' in a single entity at this point. ***FE*** has identified the critical success factors from the most successful efforts and has packaged them into a recommendation for Washington that builds upon the experiences of others but customizes it to the political and operational environment of State and local stakeholders. It should be noted that several organizations, including SAFECOM and APCO, have recognized the progress that the Washington SIEC has made to date.

- There is a need for strong sponsorship, preferably at the highest levels to ensure that the stakeholders recognize this is a serious and committed effort on the part of everyone. Stipulations of clear goals and objectives, as well as limitations of power, are critical for the governance body and stakeholders to understand.

The Washington SIEC represents the sponsorship of first responder communications within the State of Washington representing both local and State public safety agencies. The challenges facing the SIEC include:

- Develop the governing policies that will enhance interoperability.
- Manage and champion the statewide momentum toward interoperability.
- Promote cooperation and coordination of stakeholders across the State.
- Provide support on technical and funding issues.
- Accomplish this all in a strong, home-rule environment.

It is recommended that governance considerations attempt to align with SAFECOM's recommendations for interoperability. SAFECOM was formed to serve as the umbrella program within the Federal Government to assist local, tribal, State, and Federal agencies to improve public safety response through

more effective and efficient communications. SAFECOM has identified five key issues in achieving interoperability among public safety networks:

- Coordination and Partnerships.
- Funding.
- Spectrum.
- Standards and Technology.
- Security.

As previously mentioned, there is no established "best practice" model to follow from other States. All strive to form an organization that is representative of the user community in order to effectively address interoperability needs. Washington's SIEC has moved aggressively to establish mission, vision, membership, regular meeting schedules, and sub-committee responsibilities. Much has been accomplished that can form the foundation for achieving goals and objectives in the future.

A snapshot of other SIECs providing insights into what they have learned can be found in Appendix 3. The appendix provides a detailed analysis of what other States considered as they worked through governance, oversight, collaboration, and policy issues. There are lessons that can be learned and pitfalls that can be avoided. While no two states have identical governing requirements and responsibilities, many of the same coordination, cooperation, and communication issues have been addressed by others. The recommendations for governance presented in this report take into consideration many of these lessons learned.

5.2 Recommended Actions

The following are recommended governance actions to improve the effectiveness of the SIEC. They reflect lessons learned from other SIEC organizations are well as input from the nine Regional Forums conducted throughout the State. In general, they directly embrace the SAFECOM components for achieving interoperability in public safety networks, that is: Coordination and Partnerships, Management of Funding, and Standards and Technology.

Coordination and Partnerships

These recommendations are focused on providing cooperation within the user community and the SIEC. They are intended to narrow the gap between perception and reality. They also attempt to eliminate boundaries that can create challenges in the overall interoperability effort.

SIEC Representation

Recommendation: Extend membership to a Public Safety Answering Point organization. The PSAP's represent a critical stakeholder group relative to radio interoperability and should be actively represented on the SIEC.

The PSAP group has a significant role in the day-to-day operation of the overall first responder community and can bring a cross-agency operational perspective to the SIEC's membership. PSAP representatives are included in several other state SIEC's, including Oregon and Montana.

SIEC Meeting Locations

Recommendation: Consider conducting meetings in other locations of the State extending beyond Olympia.

While it is recognized that this creates an additional travel burden for the 'west-based' members, it is a fair-sharing action that will help to solidify the equality of the committee. Every region of the State should have the opportunity to attend meetings of the SIEC, meet with the members, and discuss the important interoperability issues of the region. Another suggestion would be to coordinate SIEC meetings with planned educational opportunities sponsored by vendors and/or panel discussions on various topics of interest. Inviting local legislative representatives to participate could ensure cooperation at key government levels. This will foster cooperation and ownership of the process.

SIEC Meeting Frequency

Recommendation: The SIEC should meet a minimum of every 6 weeks. Preference would be once per month through the development stages of the strategic plan.

Regular meetings are key to maintaining momentum in the process. Almost all other SIEC's that were contacted meet approximately once per month. The need to meet more frequently than the current schedule will increase as decisions are required regarding the strategic plan.

SIEC Advisory Workgroup (SAW) and Technology and Frequency Management Work Group (TFM)

Recommendation: Merge the SAW and Technology and Frequency Management (TFM) Working Groups in order to streamline their efforts in support of the SIEC.

In reviewing meeting notes from the SAW and TFM Working Groups, it became clear that the membership is nearly identical in both groups, and that meetings are coordinated such that they can take place in succession.

Create an SIEC Outreach Work Group

Recommendation: Improved communications regarding collaboration and operational successes that are taking place within the State and with local/tribal agencies will be a critical aspect of ongoing adoption of the overall strategy and goals. An Outreach working group should be formed to expand on the current communications efforts that are taking place.

In every SIEC analyzed, the outreach effort was found to be a key component in addressing the issues of the user community through effective communications. In addition to a website and brochures, SIECs use newsletters and e-mail, and one produced a DVD to use during meetings and regional events. SIEC representatives should attend local meetings and events to promote SIEC efforts. The Regional Forums recently held around the State clearly indicate that there are issues concerning the availability of information on technology, standards, and training that must be addressed.

Also, information on the activities of the SIEC, the technologies considered, and resources that the SIEC provides either directly or through its Work Groups, should be made available to the user community. Educational opportunities should be coordinated using professional firms and the vendor community at regional and local forums and be attended by SIEC and work group members.

Encourage the formation of Regional Interoperability Work Groups

Recommendation: Where they do not exist today, form Regional Interoperability Work Groups.

Lessons learned by other SIECs indicate that user community participation in the SIEC process in rural areas is not as active as in the urban areas. To facilitate participation in all portions of the State,

Regional Interoperability Work Groups could be an excellent conduit for local agency representation and involvement. The SIEC would provide resources for the Regional Work Groups such as interoperability techniques, standards, technology guidance, and spectrum coordination. Some regions in Washington have already done this on an informal basis.

Establish an SIEC Interoperability Coordinator

Recommendation: Provide additional resources to manage the ongoing interoperability efforts for the State agencies and to coordinate with the local/tribal agencies by establishing an Interoperability Coordinator position reporting to the SIEC manager.

As Washington moves toward statewide interoperability, the coordination of activities will require additional resources to support the SIEC manager. The SIEC should appoint a full time Interoperability Coordinator, reporting to the SIEC manager. The SIEC manager must bring together all activities in support of the SIEC goals, including legislation, technology, funding, construction, and operations. This Interoperability Coordinator would be in addition to the resources that are planned for frequency management.

Management of Funding

Various funding vehicles are available for financing interoperability programs. These programs must be identified, researched, and coordinated for the benefit of all statewide agencies.

Consolidate Funding Resources

Recommendation: Use the SIEC Advisory Funding Enterprise (SAFE) Working Group as the funding resource body for local agencies to use regarding interoperability improvements.

This process would ensure that adherence to any technical and programmatic standards adopted by the SIEC were followed prior to funding approval. This working group should also coordinate closely with the Department of Emergency Management (DEM), Homeland Security Section personnel, ODP, and DOJ among others, to search for and qualify viable funding programs for the user community. Additional information can be found in Section 7 – Funding.

Standards and Technology

Standards are not just applicable to technology. They also include the process by which agencies will gain approval for funding.

Why create technology standards and what should they consist of?

Virtually no one would argue that public safety mobile radio standards would not be beneficial to first responders. A great deal of effort has been invested by numerous organizations to develop these standards, formally know as P25. However, as these standards have been released, there has been a growing resistance on the part of some users, to embrace them. This resistance is predictable and one only has to look back at the history of the computer industry to understand where public safety mobile radio is today.

For years, computer designs where proprietary. Computers from different manufactures could not run the same software, use the same peripherals, or even communicate with each other. Once they made the investments, customers were locked into a single manufacturer and as time went on, it became nearly impossible to switch. This stifled the market; prices remained high, innovation was stagnant, and one or two companies dominated the industry.

Beginning in the 1980s, a revolution in the computer industry took place. Two standards evolved that changed the market forever: the IBM compatible personnel computer and the TCP/IP communications protocol that forms the basis for the Internet. Today, computers are available from numerous manufacturers, plug-and-play peripherals are commonplace, software is a commodity, prices have dropped to less than one percent of the past, and the Internet effortlessly connects millions of computers with no compatibility problems. Yet in the early days of this computer revolution, there were those who refused to adopt these emerging standards.

Public safety organizations must adopt standards if they ever want to achieve interoperability and drive down costs. There really is no other alternative; any other approach will only provide short-term fixes. Manufacturers will resist this trend as long as possible lobbying users as to the pitfalls of standards. We must clearly recognize that the motivation is economic; once standards are adopted by the user community, numerous manufacturers will enter the market and prices will tumble. One need only look at the cellular industry where today's highly featured digital phones cell sell for a fraction of the price of yesterday's simple analog devices.

The current and evolving standard for public safety mobile radio is P25. Numerous local, county, and state governments across the country have adopted this as their standard. Some states have legislated it making P25 now a matter

of law. Virtually every major Federal government agency excluding the military have adopted P25 and even the military have selected P25 for communications in domestic situations.

Although P25 is not currently the lowest cost solution, it will become the lowest cost due to market forces in the relatively near future. Conversely, proprietary solutions will remain higher in cost and actually increase over time as more organizations abandon them. Users buying simplistic, analog, wideband radios believing they are saving money will find themselves where analog cellular users are today: with a unsupported technology that has none of the new features of digital systems and at a significantly higher operating cost.

The question then comes down not to if P25 should be adopted, but rather how and when. Federal Engineering recommends that Washington State adopt P25 as its standard. The phasing-in of this approach could be based upon new procurements as follows:

- Any new trunked systems must be P25.
- Any new system that requires advanced digital features must be P25.
- Any new system that must interact with the State's infrastructure must be P25.
- Standalone systems (e.g., DOC) can be P25 on an optional basis until the economic gap between P25 radios and proprietary radios narrows sufficiently.
- Simplistic analog systems that will not require advanced features over the next 5 years can be P25 on an optional basis until the economic gap between P25 radios and proprietary radios narrows sufficiently. VHF narrowbanding may have to be addressed in this timeframe; if so, an interim standard using that technology may be considered.
- Very small local systems (e.g., local volunteer fire departments) can be P25 on an optional basis until the economic gap between P25 radios and proprietary radios narrows sufficiently.

The SIEC SAW would monitor changes in the standards environment relative to P25 Phase 2 as well as the emerging capabilities of Internet protocol (IP) and provide ongoing guidance to the SIEC regarding the implications of those events. A deviation process should be developed by the SAW to address those cases that need special consideration.

By taking this approach, Washington State's adoption of the P25 standard will evolve as the industry evolves. The overall impact will be spread over time and the amount of stranded investments in non-standard technologies minimized.

Develop Technology Standards

Recommendation: Where feasible, and in accordance with the State's strategic plan for statewide interoperability, a minimum level of technology standards should be established.

To create the desired level of improvement in interoperability, a clearly defined set of baseline technology standards will be required. This should be a high priority for the SAW, recognizing that this may require a phase-in process to best enable the migration of State and local/tribal agencies to the desired architecture. Standards will improve interoperability, encourage a multi-vendor environment, reduce costs, and garner more Federal funding.

Develop Funding Standards

Recommendation: The SIEC should require that applicants for State and Federal grant appropriations which are coordinated through the State Homeland Security process, comply with a set of grant application standards. Further, grant applications should follow a documented process that includes a formal review and signoff/recommendation by the appropriate SIEC subcommittees.

A clear definition of the documentation requirements for the various grant processes, as well as providing best practice-type support, would improve the potential for obtaining additional grant funding for interoperability initiatives.

Frequency Management

Recommendation: Centralize the coordination of statewide frequency management in a sub-committee that reports to the SIEC.

As stated in the SIEC Interim Plan of March 30, 2004, effective allocation and management of the frequency spectrum is essential. Coordinating the use of existing spectrum among the Washington's user community, and adding to the spectrum pool when possible, will enhance interoperability. Centralizing this effort under one group will improve interference issues in the field. The two resources outlined in the Interim Plan should be assigned as soon as possible.

In summary, the Washington SIEC is doing an excellent job in its initial endeavors. The recommendations summarized above would provide an incrementally stronger capability to achieve the mission and vision of the organization and create a highly interoperable environment across the State.

6 FUNDING RECOMMENDATIONS

Funding is one of the most significant obstacles to achieving interoperability in Washington as it is in most states. It was well documented in interviews, stakeholder forums, and other conversations with the stakeholder community that the current state communications capabilities across Washington are a direct result of funding limitations.

There will never be enough money to address all of the needs of public safety first responders and State public safety agencies. Although great progress in the availability and magnitude of Federal funding has been made over the past couple of years, there remains a significant funding gap. In order to narrow this gap, Washington has many important decisions ahead as the State tries to improve public safety radio communications interoperability.

This section will provide funding recommendations. Funding mechanisms that are in use within the State of Washington, and in other states, are summarized in Appendix 4.

6.1 Recommendations

As Washington proceeds with its plan to improve radio interoperability, funding the necessary changes will be a critical success determinant throughout the process. Washington should develop a Funding Plan that will generate the resources necessary to support the one-time and the on-going costs associated with improving public safety mobile radio interoperability statewide. This plan, delivered annually to the SIEC, should include the following:

- **Federal Grants**: The SIEC should look to broaden the scope of grants that are utilized to support PSMR Interoperability. The SAFE Working Group (see Governance Section) should search and qualify viable programs. SAFE should work with EMD's Homeland Security Section personnel and other similar funding agencies to develop a procedure to qualify applicants per the SIEC qualification requirements.

- County and local administrations should be encouraged **to fund their local initiatives** and would receive favorable consideration in the allocation of State and Federal funds. It is anticipated that "matching grant" provision will be more prevalent in future Federal Homeland Security grants than in the past.

- **Additional revenue sources** from sales taxes, bonds, motor vehicle insurance surcharges, motor vehicle license surcharges, additional fines

for traffic violations, road taxes, and 9-1-1 type voter approved initiatives (e.g., additional 9-1-1 surcharges on landline and wireless billing) should be considered to provide a portion of the funds needed to build and operate new systems. New or additional sales tax increases may be implemented in some counties. It is recognized that most of these approaches require a referendum to implement, and that it is typically not a popular approach. However, if the proper case is made to the public, it is quite possible that some of these approaches would be successful.

- Once a technical architecture is determined, the State should evaluate the potential of moving to a **"user fee"-based system**. This may offer State agencies and local entities a more predictable expense flow than major capital purchases on a periodic and often unpredictable basis.

- Some vendors are offering **private/public partnerships**, particularly where there is an opportunity to share State assets, such as towers. As long as the overall control of the assets and system remains with the State, this may offer an opportunity to lower the costs of new systems.

- Vendors may also offer **lease-purchase arrangements**, whereby agencies can avoid much of the up-front capital expenditure by leasing parts or all of a system. The State should consider lease-purchase arrangements and the cost/benefit tradeoffs associated with them.

- A potential revenue stream that could be considered would the leasing of **commercialize available antenna space** on the State's tower and radio site assets. WiMAX is a standards-based wireless technology that provides high-throughput broadband connections over long distances that is expected to be deployed in the next few years. Industry analysts believe the nationwide WiMAX Market will be worth anywhere from $3 billion to $5 billion by 2009.

The overall funding process is one of the most critical aspects of building a highly interoperable public safety mobile radio capability. Processes must be closely coordinated with the planning and operational aspects of the system. Most important will be actions taken to align funding with the governance process as defined in the Governance Section of this report, and as implemented by the SIEC.

7 TECHNICAL ARCHITECTURE PLAN

This section outlines a series of potential migration paths for State and local/regional/tribal agencies to consider in order to improve radio communications interoperability. There are significant advancements being made in radio communications technology, and Appendix 5 provides a detailed analysis of current and emerging technologies. In this section we will deal with proven solutions that are available today and have conscious stayed away from "bleeding edge" technologies.

The existing technology profile across the State is primarily analog, with a blend of VHF, UHF, and 800 MHz systems in use at the local level. The State agencies utilize low-band, VHF, and 800 MHz systems, also primarily analog. Figure 7.1 below shows a profile of the primary frequency bands in use at the local/tribal agencies across the State. The primary frequency band, VHF, is shown as the background color with the additional bands shown in smaller squares. These squares do not indicate the location of the specific systems, but rather the relative number of these systems to the base (more squares equals a larger number of systems in that band). Additional detail on these specific systems will be available from the SIEC Interoperability Survey, expected in January, 2005.

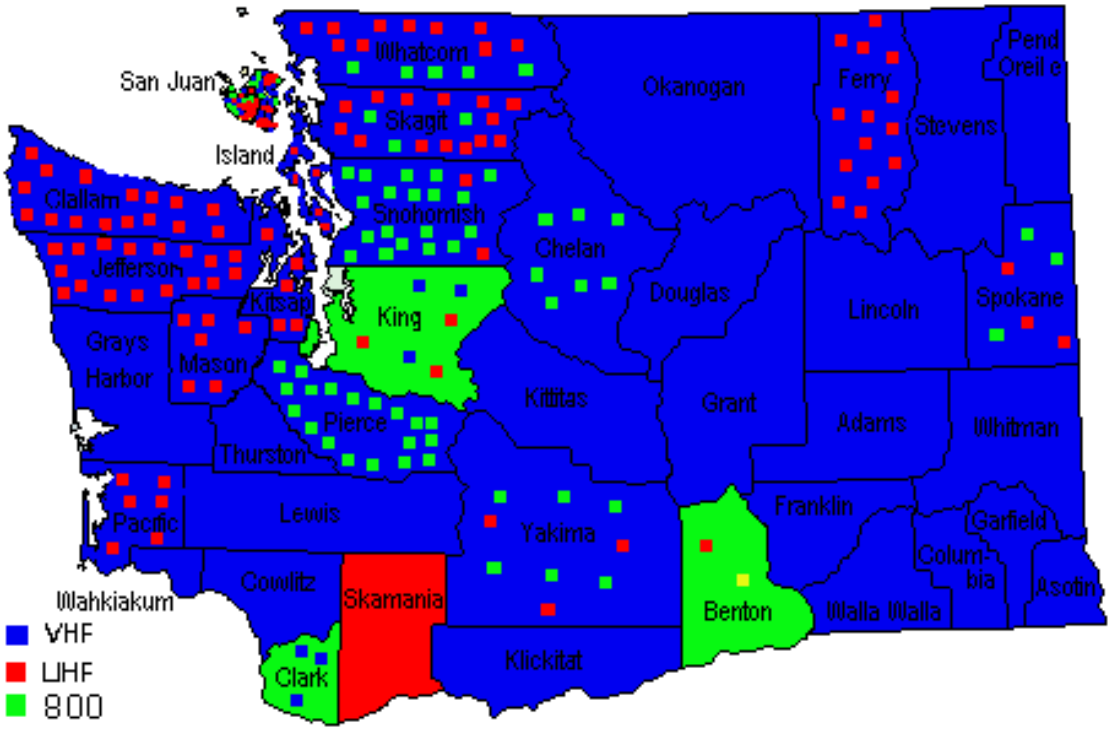


Figure 7.1 – Primary Frequency Bands – Public Safety Communications Systems (Source – Motorola, Inc.)

The majority of systems are in the VHF band, but with a strong presence of 800 MHz systems in the I-5 corridor. Approximately 40% of the state's population is served by 800 MHz systems. This is also the primary frequency used by the Department of Corrections (DOC) and the Washington State Department of Transportation (WSDOT). According to the December 2003 Inventory of State Government-Operated Public Safety Communications Systems, 62% of the State radio assets operate in the 800 MHz band, making it the largest single band of use for State agencies.

Little of this equipment is currently P25 capable, although recent purchases of subscriber equipment in some cases (such as WSP and DNR) was for equipment that can be upgraded to P25.

Recognizing the wide range of communications systems technologies in use across the State, migration options should begin with existing capabilities and evolve toward a statewide, integrated communications network. Acknowledging that some agencies have moved aggressively forward on the technology curve while others have been constrained by limited funding and resources, a growth plan that builds on the investments already made by all stakeholders is prudent. No agency, whether the largest State or smallest local organization, would desire to move backward from their individual achievements and investments to date.

The concept for integrated communications migration involves an evolutionary process beginning with current capabilities and ending with desired statewide interoperability. Recognizing the advantages inherent to a controlled migration process, a strategic ten-year roadmap would provide various intermediate plateaus for capability tracking. Each plateau brings all participants progressively closer to statewide communications interoperability.

This is not a "things you start today" versus "things you start tomorrow" strategy. Rather, it is a concurrent portfolio of interrelated actions designed to provide guidance for all agencies in their migration path toward reaching their required level of interoperability.

The Overall Concept

The proposed architecture has the following key elements which will be described in greater detail later in this section:

- A common statewide microwave/fiber backbone, owned/managed by the State and providing connectivity for all State agency radio systems and local systems as appropriate.
- A common statewide radio system to be utilized by all State agencies that require statewide coverage.

- The ability for local agencies to join the State's radio network utilizing one of several methodologies as determined by their individual/regional requirements and funding.
  - Mutual aid frequency connections.
  - Console patch (where compatible).
  - Gateway (hardware or IP-based) connections.
  - Proprietary or open-systems based standards interface.
  - Subscription to the State system by providing their own subscriber devices and using the state infrastructure.

In the short-term, the State agency and local planning efforts should be closely coordinated so that further barriers to interoperability are not created. This would be done primarily through the SIEC/SAW efforts.

State Agency Planning

The SIEC should lead the way in terms of providing a vision for the future of public safety communications within Washington. The SIEC should set standards and provide the direction to be followed by local, tribal, and other participating groups for whom interoperability is important. Up until recently, planning for State agency radio networks has been done, for traditionally good reasons, generally on an agency-by-agency basis. Funding has also been authorized in similar manner. Thus, each agency designed and implemented a communications network that was optimized primarily for its own needs. There was limited sharing of infrastructure and of information. Systems were built that met the needs of each of the agencies and good efforts were made to provide interoperability after the fact.

As with most systems, changing the way a radio system functions or interfaces after it is designed and implemented is typically much more expensive and operationally difficult than if the requirements were built in from the beginning. The SIEC must now start to enforce the Guiding Principles that it developed:

- Build wisely, build once and share often.

- Spectrum licensed by the State should be maintained as a natural resource and, to the greatest extent possible, be shared and maintained to provide the greatest return on investment.

- Communication solutions should be based upon non-proprietary "open" standards when possible.

- Topography and population density may dictate the appropriate use of radio frequencies and technology. For example, areas in Washington State that have mountains and tall buildings may require different technology than areas where there are extensive flat lands.

- All solutions for State funded radio systems should consider the sharing of assets between State and local governments when possible.

- All solutions using state funds should be planned with an enterprise view towards connectivity and interoperability with State communications assets.

- All equipment shall have a lifecycle strategy to assist in planning and management.

The State should also consider Federal requirements, mandates, and directions in this planning effort.

State Initiative #1 – Expand/establish a common statewide backbone

The State should view the communications backbone as a statewide resource, rather than a series of departmental networks that are individually managed and controlled. Radio systems are similar to Local Area Networks or Wide Area networks (LAN's and WAN's) in that they depend heavily upon a backbone network infrastructure to interconnect them. As the potential for a single radio solution to resolve all statewide interoperability issues is not likely or affordable in the short-term, a common backbone capability becomes critical in order to link the various systems together. The following areas should be explored in order to develop a plan for a common backbone capability to serve all stakeholders:

- The primary focus should be to provide connectivity for today's State networks, including DNR, WSDOT, WSP, and EMD. IWN requirements should be factored in where available or projected, for both interoperability as well as funding considerations.

- Plan to add connectivity for regional networks based on their planning/prioritization processes, and for the emerging State network based on the capacity and needs analysis for that project.

- Assess the management and chargeback options for this network, possibly using the "Center of Excellence" approach (leveraging the knowledge of existing agencies that provide similar capabilities to establish the centralized control capabilities). A starting point would be the hypothesis that DIS could offer this centralized management as they do for other networking services. Chargeback rates and processes should encourage participation rather than encouraging workarounds. The centralization effort would have to take into consideration any legislative or constitutional issues that may affect the ability to fund and/or manage shared infrastructure.

- Transition costs from the current investment base and operational costs would be developed once the target architecture and implementation plan were developed.

State Initiative #2 – Develop a common, standards-based statewide voice and data radio network for State agencies

The second initiative that should be started is to determine the overall direction of State agency networks, and particularly to determine the degree to which a single network can be designed to provide communications for most if not all State agencies.

A fundamental assumption of the planning process is that most, if not all, of today's technology will need to be replaced over the next ten years as equipment reaches its end of live and as technology changes. The primary drivers for this are:

- The requirement to move to narrowband VHF channels.
- The rebanding efforts that will be required at 800 MHz.
- Replacement of older equipment due to failures, lack of spare parts, withdrawal of manufacturer's support, lack on features, and lack of trained resources to maintain them.
- Forthcoming Federal requirements which will require the hardening of certain critical infrastructures.

This includes subscriber units (voice and data), base stations, repeaters, and consoles. The replacement strategy for this equipment should be based on maximizing the ability to interoperate as well as minimizing costs. Of course, there are a few exceptions (such as DNR utilizing P25-compatible equipment) where the implications of the various technology and regulatory issues have been addressed already, but it is believed that this is the exception rather than the rule.

Further, it is expected that the use of mobile data will become even more important over time than today, and demand for both applications and bandwidth will drive additional capacity and coverage requirements.

To accommodate this process, the State must identify and quantify the imperatives for change for each of its current networks (narrowbanding, technology refresh, coverage, NIMS, etc.). Once this is accomplished, a common planning effort should take place across the primary agencies (DNR, WSDOT, WSP, EMD, DOC) for both voice and data capabilities. This effort should be driven by the SIEC as a major interdepartmental initiative and should be completed prior to any major changes to the existing networks other than those necessary to sustain basic network operations.

Once the functional requirements are understood, the standards should be developed that the network design will be based upon. The existing standards that are supported by organizations such as SAFECOM, EIA/TIA, APCO, DOJ, and ODP should be strongly considered, with particular consideration of the Project 25 (P25) standards as mentioned earlier.

The State should develop a detailed implementation plan that will integrate with existing planning efforts that are underway, such as the State patrol narrowbanding effort and the WSDOT Wireless Communications Needs Assessment, and with known regional/local/tribal and Federal initiatives. This would include identifying existing "Centers of Excellence" within the State agencies for providing a knowledge base for each major component of network planning and operation (system operation and management, tower/coverage planning, data network, etc.). Other efforts that would support this plan should include:

- Evaluation of any immediate interoperability initiatives that could start to link disparate networks together as the overall plan is developed (ACU-1000, IP Gateways, etc.).

- Development of potential prototype interoperability approaches for regional/local communities of interest (e.g., how would this proposed system interoperate with a legacy VHF analog system, or a digital trunked 800 MHz system; develop prototype mutual aid/MOU documents, etc.). It is likely that a "hybrid" approach of multiple systems interoperating through a range of approaches will prevail in the short-term.

- Identification of existing initiatives at the State or local/tribal level that could be used as learning experiences, particularly for frequency sharing and implementing mobile data systems. The mobile data projects should include a wide range of bandwidth capabilities, including "hot spot" and ad-hoc or mesh networking capabilities.

- Creation of an ongoing review process to understand the evolving requirements (process and functionality), standards, and technology changes, and identify any policy/legislative changes that may be required based upon the ownership/management and cost recovery models that are recommended.

- Identifying sources of funds and develop an overall funding strategy with initiatives that can be targeted to support the lifecycle costs of the plan, including both initial acquisition as well as ongoing maintenance.

- Recommending legislative actions that may be required to support funding requirements.

- Reassessing short and long term plans on an annual basis.

As the State process begins to solidify and show measurable progress, the local/regional planning efforts should be initiated if they have not already begun. Many of the regional stakeholders indicated that they would be willing to follow a State plan once it was developed, as long as it was not considered an "unfunded mandate." Having an overall State vision demonstrates to the regional/local entities that there is a direction and a plan, and while they may or may not agree with the plan, the case is made that not having interoperable communications is not an option.

This is as much, if not more, of a leadership challenge than a technology challenge. It is no easy task to engage the hearts and minds of the many first responders in small towns and tribes to follow a plan that will ultimately change how they operate. The resistance must be openly solicited and managed once it is identified.

It must be reinforced that the challenge in accomplishing all of this is not one that is posed by the technology. There are a multitude of technological solutions that can be applied to solve the interoperability issues. The foundation for making this a successful effort is grounded in the leadership and governance approaches that are taken by the SIEC, particularly to the point that the regional and local agencies fully embrace the importance of statewide interoperability.

Local Agency Planning

Local organizations have the best understanding of their interoperability needs and as such, should be responsible to developing their regional plans. The starting point of these efforts is for each agency to assess their current capabilities and requirements for interoperating with other agencies – local, regional, State, and Federal. Many agencies have already completed this assessment; the SIEC Interoperability Study Survey results, to be available in January 2005 will provide a baseline for all agencies that participated. The following analytical structure is suggested (shown with sample entries):

Agency to Interoperate With	Frequency of Interoperability	Method of Interoperability
Local Fire	High	Mutual Aid
Local Law Enforcement	Medium	Console Patch
Local EMS	Low	Cell phone
Regional Fire	Medium	Mutual aid
Regional Law Enforcement	Low	Console patch, cell phone
State Patrol	Medium	Radio Swap

Fish & Wildlife	Low	Mutual Aid
Others, to cover all required agencies	Etc.	Etc.

Once this analysis is completed, the local agency can consider which of the available interoperability methods are best suited to their needs taking into account such factors as priority and affordability. While much of this analysis may have been completed on an informal basis, it is recommended that this level of planning be formalized and documented to provide an overall baseline for the agency and for the State. The external initiatives such as FCC-driven VHF narrowbanding, availability of frequencies (potentially coordinated through the SIEC resources in conjunction with the Region 43 planning efforts), aging technologies, scarcity of replacement parts, and limited budgets will all be taken into consideration as each local/tribal/regional planning effort takes place.

The methodologies available for improving interoperability are described in great detail in Appendix 5 – and are summarized here, with guidelines as to which methods may be the most likely to consider for the nature of the interoperability requirement (low, medium, and high) with another agency:

Level of Interoperability	Most likely approaches
Low	Radio Swap Shared Channels (Mutual Aid, LERN, REDNET, OSCCR, etc) Console patch Gateway (incident-driven)
Medium	Shared Channels (Mutual Aid, LERN, REDNET, OSCCR, etc) Console patch Gateway (incident-driven or permanent)
High	Shared Channels (Mutual Aid, LERN, REDNET, OSCCR, etc) Gateway (incident-driven or permanent) Proprietary Shared Systems Open Standards Shared Systems

There are some excellent examples of how this is being done well, as outlined in Section 3. Further sharing of these experiences would be highly beneficial to those agencies that have not yet begun their interoperability analyses. As outlined in the SAFECOM Interoperability Continuum (Figure 7.2) below, changes in processes, documentation, and governance should also be considered in order to best support the various technology choices that are utilized.

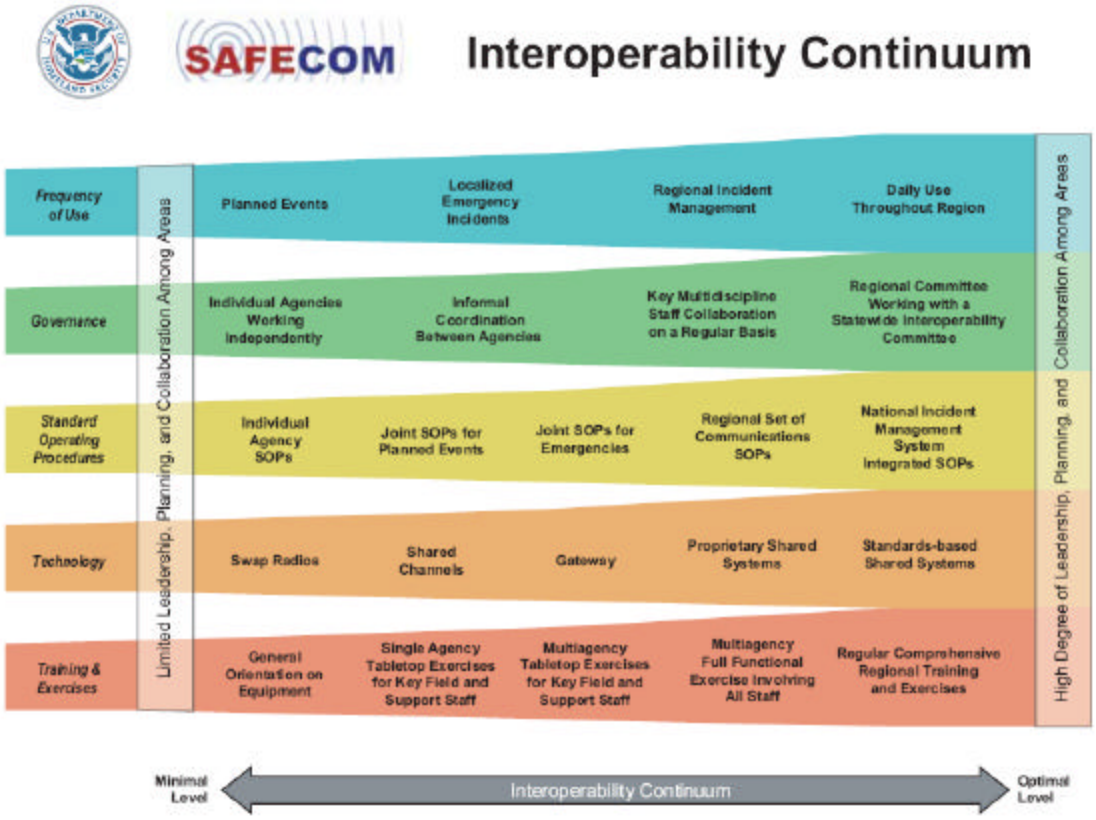


Figure 7.2 – SAFECOM Interoperability Continuum

<u>What's different about this approach than how it is today?</u>

Obviously there are no "silver bullet" solutions to the interoperability challenges facing the State and the local/tribal agencies of Washington. And as mentioned, many of the local/regional groups are already implementing these capabilities with great success. The primary differences between today's situation and the recommended approach are as follows:

- There is a plan for a common backbone for State and local agencies, with consideration to IWN and other Federal requirements as appropriate.

- There is a convergence of State agency networks to one common infrastructure from the several that are in place today.

- There is a defined path for the development of a statewide data network.

- There is a stated architecture and set of supporting standards for the local/regional agencies to utilize in their planning processes.

- There are better-defined paths for the local/regional agencies to follow to enhance their interoperability with each other and with State agencies. The subscriber network concept would envision a statewide infrastructure of towers, frequency-managed spectrum, and lifecycle support structure. Agencies desiring to participate in the systems would connect through a common architecture portal.

8 GOALS, RECOMMENDATIONS, AND INITIATIVES SUMMARY

Washington State has done a good job in beginning to move toward statewide communications interoperability. The SIEC is founded on solid principles and leading statewide initiatives. This section outlines a set of goals, initiatives, and recommendations to continue the momentum already established by the SIEC.

A migration path will be established to move the State from current conditions to significantly improved communications interoperability. A focused planning process to integrate systems and bring best practices to all stakeholders will achieve statewide communications interoperability in the future.

Chart 8.1 on the following pages summarizes the Goals, Recommendations, and Initiatives that the SIEC should incorporate for providing overall communications interoperability. The nine goals previously described are identified and mapped to the recommendations previously discussed for Governance, Funding, Process, and Technology. A cost estimate for the various short-term initiatives is provided. The Basis of Estimation (BOE) is available upon request.

Chart 8.1 – Goals and Recommendations

Goals, Recommendations, and Estimated Cost													
				Establish statewide interoperability as a high priority for all stakeholders, including Federal, State, local, regional, and tribal agencies and entities.	Maximize the improvements in interoperability by institutionalizing collaborative approaches across the State based on common priorities and consensus at the regional level.	Create an architectural approach that establishes a framework for interfacing between disparate systems, and promotes migration to new technologies in line with relevant standards platforms. Do this by establishing a common set of standards, processes,	Migrate State agencies to a common public safety communications system.	Provide for a technology environment that allows evolutionary migration of State, local, tribal, and regional systems to the level of interoperability that is appropriate for their mission.	Optimize the use of all funding sources at the Federal, State, and local/tribal levels.	Maximize the use of "best of breed" approaches to improving interoperability.	Create a statewide backbone capability to provide regional and local connectivity, where most appropriate.		
Category	**Duration**	**Recommendations/Initiatives**	**Progress to Date**	**Goal 1**	**Goal 2**	**Goal 3**	**Goal 4**	**Goal 5**	**Goal 6**	**Goal 7**	**Goal 8**	**Estimated Short-term Cost**	
Governance	Short-term	Empower the SIEC to make changes in the membership without requiring legislative intervention.	🟡	x	x	x							
	Short-term	Extend membership to a Public Safety Answering Point organization. The PSAP's represent a critical stakeholder group relative to radio interoperability and should be actively represented on the SIEC.	🟡	x	x	x							
	Short-term	Conduct meetings in other locations of the State extending beyond Olympia.	🟡	x	x	x						$10K	
	Short-term	The SIEC should meet a minimum of every 6 weeks. Preference would be once per month through the development stages of the strategic plan.	🟢	x		x							
	Short-term	Merge the SAW and TFC Working Groups in order to streamline their efforts in support of the SIEC.	🟡	x	x								
	Short-term	Improved communications about the collaboration and operational successes that are taking place within the State and local/tribal agencies will be a critical aspect of ongoing adoption of the overall strategy and goals. An Outreach working group should be formed to expand on the current communications efforts that are taking place.	🟡	x	x							$20K	
	Short-term	Where they do not exist today, form Regional Interoperability Work Groups.	🟡	x	x	x		x					
	Short-term	Provide additional resources to manage the ongoing interoperability efforts for the State agencies and coordinate with the local/tribal agencies by establishing an Interoperability Coordinator position reporting to the SIEC.	🔴	x	x	x						$150K	
Governance	Long-term	Facilitate legislative changes to provide greater internal funding for statewide systems.	🟡	x		x	x		x		x		
Funding	Short-term	Develop a statewide Funding Plan that will generate the funding required to support one-time and recurring costs associated with interoperability.	🔴		x	x			x		x		
	Short-term	Use the SIEC Advisory Funding Enterprise (SAFE) Working Group as the funding resource body for local agencies to use regarding interoperability improvements	🔴	x	x	x							
	Short-term	SAFE should coordinate with EMD to develop a procedure to qualify applicants per the SIEC qualification standards.	🔴	x	x	x	x	x	x				
	Short-term	Establish a procedure for fair share grant matching funds by county and local governments and agencies.	🔴	x	x		x	x					
	Short-term	Educate key State and local legislative policy-makers regarding the need for interoperable communications.	🟡	x	x	x	x	x	x	x	x	$100K	
	Short-term	Raise the awareness level in the general public for the critical and urgent need for communications interoperability.	🔴	x	x	x	x	x	x	x	x	$150K	
	Short-term	Use the SIEC Funding Work Group as the engine for developing and implementing sustainable funding strategies.	🔴	x	x	x	x				x		
Funding	Long-term	Consider legislation to increase taxes, approve bonds, road taxes, and increased 9-1-1 surcharges to augment statewide interoperability.	🟡	x			x						
	Long-term	Once the statewide backbone is established, consider moving to a user fee-based system to offset capital network purchases and recurring costs.	🔴		x	x	x	x	x				
	Long-term	Take advantage of vendor-offered partnerships and lease-purchase arrangements where applicable.	🟡		x		x				x		
	Long-term	Take advantage of available antenna space for lease to commercial enterprise as a revenue generator.	🟡		x		x				x		

Chart 8.1 – Goals and Recommendations (cont)

Category	Duration	Recommendations/Initiatives	Progress to Date	Goal 1	Goal 2	Goal 3	Goal 4	Goal 5	Goal 6	Goal 7	Goal 8	Estimated Short-term Cost
				Establish statewide interoperability as a high priority for all stakeholders, including Federal, State, local, regional, and tribal agencies and entities.	Maximize the improvements in interoperability by institutionalizing collaborative approaches across the State based on common priorities and consensus at the regional level.	Create an architectural approach that establishes systems, and promotes migration to new technologies in line with relevant standards platforms. Do this by establishing a common set of standards, processes,	Migrate State agencies to a common public safety communications system.	Provide for a technology environment that allows evolutionary migration of State, local, tribal, and regional systems to the level of interoperability that is appropriate for their mission.	Optimize the use of all funding sources at the Federal, State, and local/tribal levels.	Maximize the use of "best of breed" approaches to improving interoperability.	Create a statewide backbone capability to provide regional and local connectivity, where most appropriate.	
Process	Short-term	Require that applicants for State and Federal grant appropriations comply with a set of grant application standards, and follow a documented grant application process for formal review.		x	x	x						
	Short-term	Maximize transferability of best practices through effective education and awareness of successes and knowledge sharing.			x			x		x		
	Short-term	Leverage experiences and lessons learned by regional and local agencies into the overall statewide capabilities portfolio.			x			x		x		
	Short-term	Maximize the sharing of information in the short term.		x	x	x	x	x	x			
Technical	Short-term	Centralize the coordination of statewide frequency management in a sub-committee that reports to the SIEC.		x			x			x		
	Short-term	Establish a minimum level of technology standards in accordance with the State's interoperability strategic plan.			x	x				x		$50K
	Short-term	Utilize "best of breed" practices to elevate the capabilities of regional, local, and tribal agencies.		x	x			x	x			$500K
	Short-term	Maximize the use of existing mutual aid channels and interconnection devices such as ACU-1000s and ICRIs.			x				x	x	x	$1000K
	Short-term	Create a statewide architectural approach that allows for the use of existing technology and establishes a framework for migration to new technologies.			x				x	x		
Technical	Long-term	Establish a common statewide communications backbone.				x			x	x	x	$39,000K
	Long-term	Migrate State agencies to a common public safety communications system.				x			x	x	x	
	Long-term	Provide a migration path for regional and local agencies onto the statewide communications backbone.			x	x	x		x		x	
	Long-term	Provide the bandwidth and connectivity requirements for State and local agencies to participate on the statewide backbone.			x	x				x	x	
	Long-term	Provide a technical standards roadmap for all State, local, regional, and tribal entities to follow.			x	x		x	x	x		

Significant Progress

Some Progress

Not started

8.1 Overall Recommendations

- Enable the migration of State agency and local/tribal participants from their current networks to a system of networks that ultimately achieves statewide interoperability at the level desired by participants. Not all agencies will have the same requirements; the architecture should allow for a range of interoperability solutions and approaches to be utilized.

- Begin the process of identifying all available funding sources across the State and develop a plan to share funding where reasonable to move local, regional, and State agencies toward the common goals.

- Identify specific "fixes" to individual agency networks that will bring improved communications efficiencies and enhance day-to-day response operations, within the next two years.

- Identify regional "bridging" capabilities that will link disparate communications across regional operations and enhance mutual aid operations, within the next two to three years.

- Identify the framework for building a statewide communications network, with subscriber participation, to enhance task force operations, within the next five years.

8.2 Governance Recommendations

- Develop statewide strategies to improve communications (voice and data) across the State. This effort should first be targeted at the State agency level, closely followed by regional consortiums where they exist, or where they may be formed based on "communities of interest" for interoperable communications..

- Provide additional statewide mutual-aid channels, processes, and resources to provide statewide coverage and connectivity into each region.

- Provide performance improvements and planning to upgrade present State/regional mutual-aid coverage and usage.

- Work with each regional system, incorporating all area users, and provide a path for each user to join into the statewide interoperability solution.

- Provide standards development, adoption, and control within the SIEC subcommittee structure.

- Define the usage and needs of the existing State (WSP, WSDOT, others) and local microwave networks to provide a statewide backbone network that may be used by all users.

- Develop the plan and procedures required to use existing resources to control and configure connectivity's as required (dynamic patching).

- Develop the plans and procedures to use a mobile radio audio "switch/gateway" for major incidents and agency interconnectivity.

- Seek opportunities for securing Homeland Security and other funds to aid in the development of the statewide interoperability solutions.

- Foster the implementation of network of interoperability gateways and solutions, through the development of policies, procedures, and training to ensure proper functionality and operations.

- Support the development of operational policies, procedures, and training plans to facilitate optimum system operations.

- Short-term legislative initiatives that should be pursued include:

    - Expanding the use of General Funds for the support of local systems and interoperability initiatives, particularly for common infrastructure, backbone and interconnection capabilities. These funds would be used to support, or be used in conjunction with, "user fees" or "pay-as-you-go" approaches to local participation.

    - Supporting the various alternatives within the funding area, as determined by additional analysis, particularly:

        - Recommend an increase to the 9-1-1 voter-approved initiative for the improvement of local/tribal radio interoperability, of an amount to be determined

        - Remind local governments that they have the authority to levy an additional 1/10th on one-percent sales tax for the use of public safety radio systems.

        - Provide for tax-exempt status for purchase of public safety radio system equipment.

8.3 Funding Recommendations

Washington should develop a **Funding Plan** that will generate the funding required to support the one-time and the on-going costs associated with improving radio interoperability. This plan should include the following sources of funds:

- Federal Grants.
- State, county, and local budgets
- Taxes, bonds, motor vehicle insurance surcharges, motor vehicle license surcharges, additional fees on traffic violations, road taxes, and 9-1-1 surcharges.
- Evaluate the potential of moving to a user-fee-based system.
- Take advantage of vendor-offered public/private and leasing opportunities.
- Consider commercializing available antenna space.

8.4 Technology Recommendations

- Provide support through processes, standards, and shared learning for the development of regional technology solutions to be developed that will provide for a customized approach for each region's intra-regional and interoperability requirements.

- Migrate initially to a single statewide backbone for use of all State and local agencies and eventually, to a combined statewide public safety mobile radio for use by State agencies and optionally, local organizations.

- Provide a set of "living" standards that will define the minimum entry-points for State, local, regional, and tribal systems to begin to interoperate with each other.

- Better utilize current systems for frequency sharing, infrastructure, and support personnel.

8.5 Benchmarks - Measures of Success

The development of benchmarks for measuring the progress towards the goals is ideally done once detailed action plans are put into place. However, the following benchmarks are suggested as interim metrics to follow until the detailed plans are developed:

- Coordinated planning achieved for statewide interoperability.

- Migration roadmap developed and accepted across the State.

- Near term improvements made in agency-specific communications systems.

- Integration of existing statewide systems achieved.

- Statewide command and control communications interoperability achieved.

8.6 Risk Assessment

There are a multitude of factors that could impact the stakeholders' ability to move ahead with the plan that has been outlined. The following categorizes some potential scenarios that might occur:

Funding/Resources

- Major reduction in Federal funding for Homeland Security grants.
    - Federal funding is a critical component of the ability to implement the strategic direction, particularly in terms of the horizon time to achieve the various levels of interoperability. A significant reduction in funding would extend this process significantly. Additionally, grant funding, should not be dependent upon for maintaining or operating systems. As a result, a funding strategy must be developed without dependence on federal grants.

- Major reduction in overall Federal grant process, including Transportation.
    - Beyond Homeland Security grants, there are other Federal funding processes that play a significant role in the ability of certain agencies, such as WSDOT, to move towards higher levels of interoperability through use of those funds. A significant reduction in that funding process would slow the ability of the affected agencies to participate. Additionally, if funds are used to enhance a State system, then some of the traditional funding sources may be lost.

- Total opposition by voters to any initiatives that require their approval.

- It is likely that voter-driven initiatives will be needed to support this project. A negative public reaction would make this source of funding less likely to be successful.

- Inadequate allocation of funding to the local and tribal agencies to enable their participation.

  - If the allocation of general funds or trust funds from the State is reduced significantly, due to budget pressures or otherwise, it will further detract from the ability of the local and tribal agencies to participate.

- Inadequate resources allocated to support the planning and implementation initiatives.

  - The ongoing support of this plan will require resources, both dedicated as well as networked. If these resources are not provided, the implementation and ongoing management of the plan will be significantly affected.

Governance

- Inability to build consensus across stakeholders, at either State or local level.

  - The support and participation of all stakeholder organizations is critical to the success of the plan. If the stakeholders do not fully embrace the need for change and achieve consensus on the direction, the resulting resistance (stated or unstated) will have significant negative impact on the ability to execute.

- New legislation that inhibits the ability of the proposed governance structure to function.

  - Any changes in legislation that restrict the ability of the ISB or SIEC to drive this process will have significant negative impact on the plan.

Technology

- New technology announcement that causes a change in migration paths.

  - A major change in technology capabilities would require a reassessment of the tactical plans as well as the long-term vision.

- Major change of standards is announced.

- A shift from the current suite of standards that have been sponsored by the various organizations such as APCO, EIA/TIA, SAFECOM, etc. would require a reassessment of the technology architecture.

- A major shift in the vendor positions relative to the existing or proposed standards would also require a reassessment of the plan.

- The existing technologies develop a major problem that prevents further deployment.

  - The existing plan is based on the assumption that the ability of various technologies to interoperate and link together will continue. A major issue in this area would have significant impact on both the tactical and strategic plans for the technology architecture and supporting processes.

- Inadequate spectrum availability to pursue the potential technology solutions.

  - While it is not clear what the specific requirements will be for frequencies, the lack of availability of certain frequencies may impact the direction and timing of several technology architecture decisions.

Environmental

- Major decrease in support from key legislators, including the Governor.

  - A shift in support from any of the key sponsors could cause a reduction in the perceived importance of these initiatives. Funding could also be impacted by this kind of a change. Most critically, it would signal to the stakeholders that this is not a priority, which would have significant impact on their desire and ability to participate.

- Terrorist or natural disaster.

The occurrence of a significant event (either natural or man-made) could cause a shift in priorities, reacting to the specifics of the incident that occurred and causing funding and process shifts that may not be in line with the long-term plan. While to some degree this kind of a reaction is appropriate, it will be critical to maintain the focus on the long-term plan while adapting the short-term changes in tactics to address the issues raised by such an event.

8.7 Summary

The State of Washington is faced with an opportunity to solve many of today's public safety communications issues and, at the same time, significantly enhance interoperability at the State, local, and tribal levels. We believe the recommendations called out in this report will go a long way to meeting the goals as expressed by the State participants. However, as the old engineering adage says: "if you keep doing the same thing, you will keep getting the same result". Washington must institute a series of changes to meet its stated goals; some will be universally embraces, some will be controversial. Regardless of the reaction, the State must take a leadership role and use its position to build unity amongst all participants in the short term and maintain a collaborative environment in the long term.

Appendix 1 - Regional Forum Summaries

This Appendix summarizes comments from the Regional Forum Meetings and provides the detailed notes.

Region 1

Date: October 22, 2004

Forum Location: Everett

Forum Attendees/Entity:

Dennis Hausman	WA DIS/SIEC
Nancy Franze	HLS
Dave Stern	SIEC
Nat Dickinson	N W LEARN
K.T. Eldredge	Tyco Electronics
Kevin Thomas, MD	Region I Hospitals
Jerry Job	Sno Cty. Fire
T.J. Young	SNOCOM – 911
John Gates	ESCA
Dan Good	ESCA
Tom Howell	SNOPAC
Larry Borrell	WSP
Gary Amundson	Motorola
Fred Radovich	Motorola

John Murray, Ray Ganner, Tom Brogelman – Federal Engineering

Project expectations:

- System capacity issues hamper interoperability.
- There is no interoperability between CAD systems.
- The agencies use VHF systems for mutual aid.
- Satellite communications is used in rural areas.
- Terrain makes coverage difficult.
- There is a wide variety of radio system being used by public safety agencies in the region – UHF, VHF, 800, analog, digital.
- There are many Canadian border issues.
- Communications system requirements are very different from agency to agency.
- Coverage in the rural areas is poor.

- Cannot communicate with federal agencies – Coast Guard, Navy, FBI…. because they are using different technology (P25).
- Cannot communicate with airborne services – helicopters and airplanes.
- Coordination of communications between agencies during incidents is done through dispatch centers.
- Policies and operational issues hinder communications between agencies.
- Improved training could improve interoperability.
- Training and drills need to be conducted more frequently.
- Procedures need to be explained so that agencies can implement them.
- Industry Canada/FCC coordination could improve the licensing process and reduce the turn around from one year.
- Licensing requests sent to Canada are routed through multiple agencies necessitating several cycles, usually 3.
- The state should set up a technical advisory committee that could assist agencies on technical issues.
- What are other states doing?
- State purchasing agency should control communications equipment purchases to insure the lowest cost and consistency in what is purchased.
- Communications system information must be made available to agencies in order to insure compatibility.
- A newsletter would be help to keep agencies informed.
- Existing associations (police, fire, EMS) should be used to disseminate information.
- Information should be sent to the agencies on a regular basis.

Funding:

- The agencies need information on available funding.
- Grants are the major source of funding.
- Funding is made available for specific purchases.
- A solid system plan is needed to help win approval of federal grants.
- Agencies need information on what funding is available.
- Consolidating funding requests is difficult because there are too many agencies with a wide range of requirements.
- The major metropolitan areas receive the majority of funding.
- If this project recommends solutions that are too expensive, nothing will be done.
- There needs to be reasonable funding mechanisms.

Technologies:

- Federal agencies are using P25 digital systems.
- Some agencies have implemented mobile data systems.
- Wide band 700 MHz data services will be implemented when they become approved and available.

- IRIS is a real time system used to track vehicles involved in emergency situations.
- The P25 objective for compatible equipment is not working.
- P25 equipment is too expensive.
- Standards do not drive decisions, dollars do.
- Vendor driven standards force agencies to change out their systems when the vendors abandon the technology.
- Mobile data capability in cars is critical.
- Data base inquiries are critical. Other applications like mug shots, fingerprints etc are “nice to have”.
- GIS information is helpful to Fire departments.
- Using data reduces voice traffic.
- Voice capability is always required; data is not.
- IP Voice is not seen as a necessity.

Commercial Systems:

- Cell phone can’t be depended on during emergencies because the system often shut down during overload situations.
- Cell phones are used in areas where there is no private system coverage.
- Commercial systems are too expensive to use.

Infrastructure:

- Access to locate on towers is a difficult process and other agencies are not very cooperative.
- Information on site location, owner, etc. would be helpful, but difficult to maintain.
- Policy issues hamper sharing of sites.

Open Discussion:

- Issues need to be resolved on a local level
- Keep it simple; do not try to satisfy everyone.
- One solution will not work for all agencies.
- Politics need to be overcome in order to be successful.
- Flexibility is an important requirement.
- A plan that supports 100% of the requirements will be too costly to implement.
- The I-5 corridor must have system coverage.

In a Perfect World:

- Can get help when needed.
- No time delays to get resources.
- Instant system access.

- Have the capability to communicate as well as you can, using the telephone system.
- Unlimited capacity.

Session Overview:

Attendance was lower than previous sessions (13) including several vendors. The region has both urban and remote areas with vast differences in geography, which creates communications "islands", separated by long distances. Voice communications are regarded as essential; however mobile data and other technologies are seen as less critical services at this point in time. Many agencies in the region have made large investments in their current communications systems and will not be eager to change them.

Region 2

Date: October 21, 2004

Forum Location: Port Angeles

Forum Attendees/Entity:

Dennis Hausman	WA DIS/SIEC
Robert Winters	US Coast Guard
Tim smith	Northrop Grumman
Ken Rose	Twisted Pair Solutions
Mike Wolniewicz	Olympic medical Center
Jamye Wisecop	Clallam county Emergency Management
Dave Richmond	Richmond Radio Com
Fred Radovich	Motorola
Jerry Sampont	PVT Citizen-retired Seattle PD
Mona Gates	Clallam City, EDC
Keith Bogues	Port Angeles fire department
Clint Casebolt	Washington state patrol
Jack Lowell	Port Angeles Police
Marc Johnson	WA D.N.R
RJ McIntosh	Coscomm Aerospace International
Paul Beckley	WSP
Clark Palmer	WSP
Les Brodie	WSP
Mary Wilgocki	Clallam County Sheriff Dept.
Tony Perkings	Sequim Police Department
Patti Morris	Clallam County Sheriff's Office
Joe Martin	Clallam County Sheriff Dept.
Dave Zehrung	Clallam/Transit/OPSCAN
Terry Weed	Clallam Transit
Bob Schwent	WSP
Ken Horvath	City of Port Townsend
Comm. Mike Doherty	Clallam County
Frank Needham	Jamestown Information Tech./JKT Developmt. Inc.
Merle Holden	Jamestown Telecommunications

John Murray, Ray Ganner, Tom Brogelman – Federal Engineering

Project expectations:

- Line A issues are a big concern.

- Dealing with Canada is very difficult and is getting worse.
- Frequency requests must be sent to Canada a minimum of three times for approval. The process takes up to three years and is limited to 5 years.
- Frequency requests are reviewed by the RCMP and Industry Canada. There is no opportunity to facilitate discussions between the FCC and Industry Canada.
- Fire, police and EMS need to be able to talk to each other.
- Major events expand agency participation dramatically. As many as 42 agencies and 4 dispatch centers as well as tribal, transit, public utilities, US Coast Guard and the RCMP can be called on to support a major incident.
- LERN does not have repeater coverage
- Coordinating up to 7 agencies during an event is common.
- OPSCAN provides the region with a communications system backbone and VPN.
- During emergencies agencies are directed to use a common frequency on OPSCAN, by dispatchers.
- OPSCAN supports all public safety, public works, Transit, tribal and utility agencies.
- MedNet has been in existence to support EMS agencies for a long time.
- MedNet is used by agencies other than EMS agencies during emergencies, if they are trained to use it.
- In the event that an evacuation is required the ability to communicate with the transit agency is important.
- Agencies in the region use all the frequency bands – UHF, VHF, and 800.
- The need to support the prison (DOC) communications systems adds to the complexity of the issues.
- The isolation of the area forces the agencies to depend on themselves.
- During major incidents federal agencies communicated with include: Coast Guard, FBI, Border Patrol and National Park Service.
- It would be helpful to have procedures that where developed by other agencies to use as a template.
- PSAP's cannot communicate to each other by radio.
- It is easier to go through dispatch than to change channels.
- Nobody is responsible to monitor LERN.
- A list of projects that are being worked on would be useful.
- Local agencies cannot implement regional solutions without help from the state.
- Communications issues are usually regional. The need to communicate outside the region is rare.

Funding:

- Funding is the most important issue faced by all the agencies.
- Financial assistance is needed to implement new communications systems.

- SEIC can help by identifying availability of funding.
- Funding is difficult to get and allocating the funds received must be done efficiently to insure day-to-day operations.
- Funding needs to be obtained to be able to implement mobile data services.
- A grant request for $700,000 was processed for a mobile data system. The grant was not approved.
- System maintenance fees need to be identified so that the agencies can budget them.
- Funding should be provided on the Federal level, primary, and State level.
- Private industries that require support during emergencies should be required to contribute to the funding of public safety systems.
- Funding must cover operational costs as well as the initial system purchase.
- Reoccurring maintenance and lease costs also need to be considered.
- Revenue for emergency equipment can be provided by State Tax surcharge.
- Fire districts are receiving less revenue because their funding source, property taxes, is being reduced.

Technologies:

- Law enforcement inquiries are done through the dispatch centers.
- Data capabilities are needed to reduce radio channel traffic.
- Voice capabilities will always be the number one priority for public safety radio systems, but data capabilities are gaining importance.
- Redundant entry of report information could be eliminated with a data system.
- P25 digital systems will not work very well in the region because of geographic issues.
- Standards should be developed on a regional basis.
- The cost to comply with P25 is too high.
- Analog radios operate better than digital radios in the area and they are much cheaper.
- Planning to migrate to new technologies is essential.
- Dispatchers prefer analog to digital primarily due to understandability.
- The area has a lot of multi-path which may support some analog conversations, but will not support digital communications.
- Narrow band migration is necessary, mandated.
- Transit will implement an AVL application next June.
- OPSCAN is using gateway devices.
- IP is part of the gateway solution.
- Phase II of OPSCAN will support mobile data, however funding has not been approved.
- Using 700 MHz would require additional infrastructure.
- Standards would be followed funding was tied to using them.

Commercial Systems:

- There are very few commercial wireless systems in the area.
- Cell phones are used for back-up communications.
- Some commercial pagers are used by the agencies.
- There are pockets of commercial system coverage in the area, but the coverage is not good enough to be used by public safety agencies.
- Use of commercial systems, where available, is too costly.

Infrastructure:

- Some agencies have towers located in Canada and some Canadian systems have towers on this side of the border.
- Natural disasters, like earthquakes, can interrupt communications by taking out tower sites.
- OPSCAN provides a redundant fiber and microwave backbone for local agencies.
- Reoccurring use fees for towers can be substantial.
- There needs to be a statewide policy for tower placement, usage and fees.
- A centralized database of all tower locations and their owners is needed. This information is available on the FCC database, but the information is difficult to use.
- Commercial sites do not have the security required for use by public safety agencies.
- Cell sites should be available for any agency to use at a fixed or no cost.

Open Discussion:

- It is important that local agencies have the capability to communicate with outside agencies, state police, using one device.
- Open standards that provide seamless operation are required.
- Line “A” issues need to be solved.
- More technical support is needed to maintain agency systems.
- Currently the systems are maintained by two private sector technicians.
- Operational protocols need to be used.
- Systems need to be well documented.
- Backwards compatibility is a requirement for any technology.
- Big city solutions for rural areas won’t work.
- EPA requirements are burdensome and can delay project implementation.
- Change is necessary for survival.
- Constituent expectations are very high.
- Coverage issues in the area are a big problem.
- Doing nothing is not an option.
- The cost of maintaining old technologies is too high to be acceptable.

- Agencies must get more efficient in order to operate with reduced funding levels.
- Good communications systems will enable more efficient operations.

In a Perfect World:

- The state EOC could monitor incidents remotely
- There would be adequate funding resources.
- Communications would be secure.
- Rural agencies would have the capability to communicate with anyone.
- PTT would get anyone, any time.
- Agencies would have video capabilities.
- Agencies would have access to the Internet in their vehicles to a lookup public data.
- Vehicles would have the ability to transmit GPS coordinates.
- Vehicles would have mobile office capabilities to support day-to-day activities.
- Fire vehicles would have mobile data capabilities to access building plans in real time.
- Vehicles would have the ability to display mug shots and all other NCIC 2000 capabilities.
- National coverage using a satellite-based system should be considered.
- System would offer local control and be cost effective.
- EMS vehicles would have mobile data capability.

Session Overview:

This session was well attended with the most diverse mix of agencies we have had to date. The agencies represented rural and suburban areas rather than urban areas. Included in the agencies represented where federal, US Coast Guard as well as a Transit representative. The major concern expressed was about the line “A” issues. Funding was also a concern raised by most of the agencies. This Region has implemented basic interoperability support using “OPSCAN” and “MedNet” which provide agency-to-agency communications during emergencies, within the region. The development of this support was driven by necessity due to the unique requirements in this region. Geographic issues, proximity to the Canadian border, a wide mix of agencies supported as well as five (5) tribal entities to support are contributing factors that must be addressed by agencies in the region.

Region 3

Date: October 27, 2004

Forum Location: Olympia

Forum Attendees/Entity:

Dennis Hausman	DIS
Peggy Fouts	Grays Harbor 911
Ken Walkington, Chief	Montesano fire Dept
	Shelton Police
Mike Akin	(SHELCOM)
Tim Smith	Northrop Grumman
Lester Olson	Thurston County EMS
John Carpenter	Tumwater fire
Travis Beecher	Motorola
John Broome	Dept. of Fish & Wildlife
Sophia Byrd	WSA of Counties
John Taylor	HS Region 3
Leroy Hunt	DIS
Jim Broman	Lacey FD
Jim Quackenbush	Thurston County
Alan Komenski	Bellevue
Terry Miller	WSDOT
Fred Baker	WSDOT

John Murray, Skip Funk & Ray Ganner – Federal Engineering

Project Expectations:

- There is a lack information regarding the plans for the WSDOT 800 MHz system
- Agencies need better access to required communications systems information
- Information needs to be communicated to agencies on a timely manner
- Systems need to be easy to use, readily available and cost effective.
- Interoperability between police and fire agencies are critical and needs to be available 24/7 and automatic.
- Controls need to be implemented to insure the availability of reliable communications during emergencies or there will be uncontrolled chaos.
- Some communication systems are duplicated within state and local jurisdictions.
- There are shortages of professional resources.
- Mutual aid regional requirements need to be addressed.

- Trust between agencies needs to be established.
- Coverage problems need to be addressed and standards developed.
- The state is trying to implement advance system support. Local agencies are trying to support basic communications.
- Interoperability within the county needs to be supported for all government agencies.
- Doing nothing is unacceptable.
- System usage disciplines need to be implemented.
- System capacity needs to be increased.
- System coverage requirements need to be realistic. It is unreasonable to think that there will not be dead spots.
- New system proposals need to be supported by the people that have control of the systems: Fire Commissioners, City Council and County Commissioners.
- It is important to get the county focused and working together.
- Training users how to use new systems is essential. A good system for training users must be made available.
- "Pure Joint Liabilities" need to be addressed.
- There is a need to bring basic communications capabilities up to a minimum level throughout the area.
- Solutions need to be locally controlled. The plan should not negatively impact a local government in doing their job.
- Large urban agencies must maintain communications capabilities with smaller rural agencies so that the smaller agencies are not left behind as technologies move forward.
- The communication system gap between state, large and small agencies needs to be closed.
- System upgrades to support interoperability must be seamless and have a positive impact on all the users.
- Interfaces between large and small agency system need to be built and supported.
- Poorer agencies need basic communications system support.
- Surplus equipment from big agencies could provide stopgap support for smaller agencies.
- A clearinghouse that identifies ongoing projects would be helpful to keep agencies informed on communications system developments.
- Strategic, wide area, and tactical day-to-day interoperability issues need to be addressed differently.

Above Line A:

- There are too few VHF frequencies available to support the traffic.
- Big agencies did not release as many VHF channels as expected when they migrated to 800.
- The US State Department could offer more support for these issues.

Funding:

- There are not enough funds available to allow agencies to get the information they need in a timely manner.
- Funding issues will force system sharing.
- The funding process is difficult and the cost to obtain funds could exceed the funds granted.
- Agencies are looking for ways to cover communications system expenses.
- Grants can offer funding “carrots” to agencies.
- Grants that allow agencies to purchase more equipment do not always address the critical issues faced by the agencies.
- Matching funds can create problems for agencies because they do not cover needed equipment or services.
- Grants do not cover maintenance costs.
- Some grant requirements do not make sense in certain areas.
- Funding requirements need to be developed from the bottom up.
- Funding for training needs to be made available in order to allow agencies to implement new equipment.
- Counties and regions should develop their own interoperability plans.
- Funds are allocated to bring agencies up to a base. This will never work.

Technologies:

- There are varying levels of technology being used by the agencies.
- A form of standardization that is acceptable to all users needs to be identified.
- Data needs to be shared on a system-to-system basis with roaming capabilities by the agencies.
- There are multiple systems that do not share data. Fire is better at sharing data than police agencies.
- Security is essential for agencies to share data.
- Information needs to be secure.
- Many agencies do not have Internet access.
- Rural areas cannot keep up with available technologies, primarily due to funding constraints.
- The state needs to develop a plan to coordinate the migration to narrowband.
- Moving to narrowband may make it difficult to communicate between agencies.
- The migration to narrowband must be vendor driven. And should be operational neutral – no additional staff required to operate the system.
- Spokane, King, Sno, Pierce and Clallam systems should be used to develop standards for best practices.
- Standards need to be implemented so that all first responders are able to communicate during emergencies.

- New system should be required to meet specific minimum interoperability standards.
- There is no compelling reason to adopt P25 standards.
- P25 standards are expensive to implement.
- It will take a very long time to implement P25 standards.
- Analog systems are better than digital.
- The state should develop a mobile data system, rather than commercial companies.
- Satellite solutions should be looked into.
- Gateway devices offer an important, easy to use and cost effective solution.
- VOIP capabilities are not understood.

Commercial Systems:

- In some cases the use of commercial infrastructure is the only alternative.
- The competition with cellular systems drove up the price of infrastructure site acquisition to public safety agencies.
- Commercial systems are only available in urban areas.
- Commercial systems have an advantage of keeping up with technology over private systems.
- In order to be considered for public safety use, commercial systems need to improve security, reliability, availability, and PS priority.
- Satellite services are too expensive to use on a regular basis.
- Some sites are shared with PUD
- A state solution would be preferred to a commercial solution.

Infrastructure:

- Counties want to use state infrastructure for cross jurisdictional support
- A clearinghouse or database of tower locations, contacts, etc. in the region would be helpful.
- The DNR is setting infrastructure rate standards; there needs to be a rate structure set for local government agencies.
- Existing microwave systems are being duplicated: DOT, DNR & WSP.

Open Discussion:

- This project will identify ideas that are important to improve current systems and make agencies more effective.
- The project should look for small successes and address basic communications needs.
- Identify microwave backbone infrastructure used by local agencies
- Keep local agencies involved in the process.
- There is a concern that the project schedule is too aggressive with an11/4 deadline.

- Do not create standards without providing funding for local agencies to implement them.
- Doing nothing is not an option.

In a Perfect World:

- All agencies would have the ability to communicate, voice and data, with all PSAP's.
- There would be no fiscal restraints.
- There would be no communications issues during drills.
- There would be a focus on training.
- Every unit would have voice and data capabilities.
- Users would have the ability to communicate to all users, work groups and dispatchers.
- APL (Automatic Personal Location) capability on every portable.
- Unlimited dynamic talk groups.
- OTAR capability
- VOIP capability

Session Overview:

The session was well attended with a good mix of agencies represented. The group participated in a lively discussion of the issues, available technologies and alternatives available to agencies for next generation systems. The attendees where well informed on the communication system issues faced by agencies. Planning, developing operational procedures, documentation, training and standards where discussed as issues that need to be addressed by all agencies. Minimum communications standards and local control are major issues that where identified, time and again, as issues that needed to be addressed.

Region 4

Date: October 18, 2004

Forum Location: Battle Ground

Forum Attendees/Entity:

Dennis Hausman	WA DIS/SIEC
Cindy Barnd	Cowlitz Co 911
Bill Mahoney	Cowlitz Co SO
Stan Munger	Longview Police Dept.
Tom McDowell	Noems/Clark County Fire
	Clark County Emerg. Serv.
Tom Griffith	Agency
Garry Lucas	Clark County Sheriff
Keith Flewelling	CRESA
Joe Farias	Motorola
Fred Radovich	Motorola

John Murray, Ray Ganner – Federal Engineering

Project expectations:

- Interoperability is the ability to communicate within and between local agencies.
- Interoperability must involve the Oregon agencies --- across the river.
- Interoperability must be convenient – on one channel
- Fire is currently carrying two radios (VHF, 800) on some equipment
- Daily interoperability between Portland (Tri County) and Clark County is a must.
- Agencies have the capability to switch over (i.e., fire to police, etc). However, they don't use the capability because they do not want to use another agencies channel.
- Need practice in the process to switch. It is not easy to do. It is easier and safer to go through your own dispatch center and have messages relayed. Again, training is needed.
- To improve Interoperability --- Training, training, training….. People are 'creatures of confront', must train, retrain and drill often.
- Interoperability processes must be committed to memory or they will not be used. If a user must look up how to connect to others, the user will not do it.
- Suggestion made: State has three radio networks, WSP, DR and WSDOT. The state should set up these systems to permit local agencies to link to and use the systems when interoperability is required

- Project expectations:
  * Plans – with options for local government to grow and afford new features in the future.
  * Not all agencies have the same funding options; need less expensive solutions for some.
  *Be sure project/plan provides a 'non-technical' description of solution, both short and long term.
  * Be able to communicate with all other agencies in the area. There is a limited need to communicate with units that are outside the area.
  * Common, affordable frequencies that support talking to all within a region.
  * WTO (Seattle riot) showed a need for a long term interoperable solution.
- Culture and 'different' languages (fire, police, and ems) cause interoperability problems.
- Interoperability (process) is a user problem on the 800 trunked system. Firm commitment from senior management will eventually resolve these issues
- Fire interoperability --- currently putting a plan in place to use existing system capabilities.
- State LERN channel does not work. LERN problems may be more operational than technical. Current capabilities --- Patches between 800, LERN and VHF.
- How to get interoperable systems; build good local systems, then expand to regional and statewide.
- Need a road map from the state. The roadmap will assist local agencies to invest in and build compatible systems in the right direction.

Funding:

- Cowlitz County currently has funding in place to begin the replacement of the existing system beginning in 2005.
- One agency said interoperability is only a money problem (opinion not shared by all). Money overshadows operational issues.
- When asked what brought the five counties (Oregon and Washington) together for the (800 smart zone); funding was given as the reason.
- Federal grants are expensive.
- If it costs more that what is in today's (local agency) budget, must have flexible funding options to purchase and maintain.
- The state should issue a bond on behalf of local agencies.
- The federal government should put up a satellite that all state and local agencies could link/connect to for communications.

Technologies:

- Mobile data capabilities are critical to operations. Clark County depends on 'silent' dispatch.
- Agencies monitor CB channels
- Proprietary vendor interests limit interoperability. Need open standards for all.
- Clark County (800 trunked) must do a digital forklift upgrade in the 2010 timeframe.
- Gateway boxes – portable version of box is not a good immediate response to an incident that requires interoperability
- Patch panels also exist to patch in VHF and UHF systems.

Commercial Systems:

- Agencies are more concerned about tower/site security than commercial companies
- Need standards for physical tower security.
- Hardware and information security within commercial facilities are also a concern.
- Incident command, health services and others use Nextel radios for backup of their radio system. They also use commercial pagers for callout.

Infrastructure:

- Towers ---great idea to work together. However, based on responses, it does not appear to workout in many cases.
- In reference to 700 MHz, we would like to be able to talk to each other in a much simpler solution. Moving from VHF to 700/800 MHz requires more towers.

Open Discussion:

- Solution comes in a box, from state, and paid for by somebody else.
- Secure, user friendly, functional systems with high availability are needed
- Speed bumps (inhibitors)
    * Proprietary solution
    * Must have various options to provide affordable solutions
    * Authority and control
    * Turf battles
    * Not just a 'one time' training approach
    * Funding, funding ….
    * Keep locals involved in process
- Management of interoperability
    * Users do not want to see a 'one group' (state) management committee, would rather see a regional approach.
    * No agency wants to be 'governed'
    * Don't want to be told what to buy

* Does NOT want WSP management of solution
* Local Agencies will not play – if outside money is not provided
* Standards are not a problem, unless it cost too much.

Session Overview:

This session was lightly attended, compared to the first four sessions. However, there was a good mix of agencies and very good dialogue. Funding, training, process and local control issues where the central issues discussed. The need for good training on existing systems as well as any new system or technology introduced was expressed by all attendees.

Region 5

Date: October 26, 2004

Forum Location: Tacoma

Forum Attendees/Entity:

Dennis Hausman	WA DIS/SIEC
Larry Bauer	Pierce Co Sheriff
Kelly Bochenski	LESA
John Pirak	LESA
Scott Umemota	Day Wireless
Travis Boettcher	Motorola
John Galle	Sumner PD
Debby Grajeda	Puyallup City Comm.
Merle Frank	City of Puyallup Fire
Fred Radovich	Motorola
Arnold Blaker	LESA
Steve Taylor	City of Tacoma
Ron Hall	LESA
Marty Knorr	WSP
Ed Smith	Pierce Co Sheriff
Tom Symonds	Region 5 coordinator
Michelle Galaz	Lakewood PD

John Murray & Ray Ganner – Federal Engineering

Project expectations:

- LESA is the primary county PSAP dispatching system and is used by most law enforcement agencies.
- LESA is supported by an 800 trunked system.
- Currently expanding the 800 system to include more agencies (hospitals, ports, schools) in area.
- The target is to have all PSAP's and agencies in the county on the system.
- There is a plan to link LESA, King, SNO, and DHS (400 MHz) systems together.
- Currently police/fire and WSP must be patched together for a regional event; there needs a better solution.
- Fire needs LERN system support. They cannot talk on LERN, listen only.
- An alternate communications path that enables dispatch and EOC centers to communicate needs to be established.
- Agencies need a way to leverage each other's communications systems.

- Communications systems need redundancies and risk mitigation built into them.
- Area agencies have a need to communicate and interface with military bases.
- Frequency coordination needs to be supported at the state level.
- Management at the local level is best.
- King County should be used as a best practice model.
- Cooperative work and a good 'agreed upon' plan are better than a mandated solution.
- All agencies need to use one language.

Funding:

- PSAP consolidation is a good idea. County almost consolidated a couple of years ago.
- PSAP funding is not distributed equitably or fairly.
- Turf wars need to be stopped.
- Money can be used to force participation.
- "Strings" on money will force agencies to work together.
- Sales tax options exist 1/10 or 3/10 of 1 percent. However, based on the current climate it is not likely that they will pass.
- LESA is funded by an operational lease.
- It was suggested that we aggregate monthly user fees from paging, cell phones and MDTs and use them as a source of funds.
- Spending of funds should be reviewed now to see if the money could be used more efficiently and any savings realized could be used as a source of sustainable funding.
- Region 5 already knows what they want for regional interoperability. The state can help with grants and identification of funding sources.
- Funding flows that are consistent with system implementation plans are needed.
- Agencies are not interested in state managed funding sources.
- Regions are all unique and they prefer to manage systems and funding on a local level.

Line "A" Issues:

- Would like to see the state intercede with the Canadian agencies on behalf of local agencies to assist in the resolution of interference problems on VHF frequencies.

Technologies:

- Gateway devices are:
    - A curse--- managing all these boxes will be a challenge.
    - A blessing – box serves a need.

- There is currently no plan in place to manage gateway devices
- P25 Standard comments:
    - P25 has nothing to do with interoperability.
    - P25 is a digital technology standard.
    - Analog coverage is better than digital
    - There are multiple P25 standards
    - Standards are not needed to implement interoperability.
- By default, the standard for local government is Motorola, 800 analog trunked.
- NPPAC 800 channels address the interoperability issues for 800 trunked users.
- Mobile data is becoming a mission critical requirement, second only to voice radio.
- VOIP is not viewed as a reliable technology when compared to existing voice radio systems.
- VOIP is not a clearly understood in terms of a RF pipe protocol.
- VOIP is acknowledged as a technology that is coming. However, there are concerns about missing mission critical voice activity if data network is not reliable.
- Agencies now share 'turn out' notes between agencies on their MDTs.

Commercial Systems:

- It was suggested that low orbit satellite systems be used as an option for interoperability and coverage issues. However, the cost is high, $90 per unit per month.
- Commercial systems must be considered in making a business decision.
- For a real partnership with Commercial vendors, the vendors must address availability, priority and reliability.
- Commercial pagers are being used. Agencies are considering building paging system but must address reliability issue first.

Infrastructure:

- There is a need for more tower locations. However, it is acknowledged that building more sites will be a difficult process, particularly getting permits.
- Would find a database of towers in region a value.
- The city and county of Tacoma currently shares some sites.

Open Discussion:

- Agencies need to change the way they communicate because they cannot communicate adequately internally and with other agencies today.
- Every major incident and drill has listed communications as the number one (1) problem.

- Trust must be developed between local agencies and the state to make this process work.
- This process is a beginning.
- Regional interoperability should be implemented first, then state interoperability.
- This process must address jurisdictions 'ownership', rights and controls. Regional buy-in is critical for success of the project.
- King County should be used as a "Best Practice" example so that other agencies can build on an existing success story.
- Local governments must be sold on why they need interoperability. They don't see the benefits.

In a Perfect World:

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- Everybody would have the ability to talk to person and location whenever they needed to.
- There would be unlimited frequencies.

Session Overview:

There was a good mix of area public safety agencies represented, although attendance was moderate - sixteen (16) attending this session, including vendors. Local control and management of systems and funds is a major concern of the agencies. The agencies have a good understanding of new technologies with current usage high and migration to new system offerings well planned for. Operational and procedural issues are being addressed efficiently, allowing the agencies to use existing funds effectively.

Region 6

Date: October 13, 2004

Forum Location: Seattle

Forum Attendees/Entity:

Dennis Hausman	WA DIS/SIEC
Spencer Bahner	King Co
Mark Morgan	Valley Com
Ned Worcester	Seattle Public Utilities
Mark Sheppard	Seattle EOC Comm.
Marina Zuctell	King Co Hospitals
Hai Phung	King County Metro
Tom Eckels	Hatfield & Dawson
Laurel Nelson	King Co. OEM
Bud Backer	King Co. Fire Chiefs, Woodsville
Mark Hagreen	City of Redmond
Gary Mullin	Port of Seattle
TJ Young	SNOCOM
Julia Duncan	USDA Forest Service
Jim Elston	DHS/CPS
Charles Radabaugh	FBI
Steve Lagreid	King Co. Sheriff 911
Morgan Balogh	WSDOT
Clark Palmer	WSP
Rex Roebuck	USCG/D13
Dan O'Leary	USCG/D13
Gail Marsh	City of Shoreline
Phyllis Hull	Port of Seattle 9-1-1
Kevin Kearns	King County
John Gallagher	Motorola
Marls Davis	King Co 9-1-1
Jim Bowman	King Co 9-1-1
Donna Cole	Valley Com
Leroy Sisley	Seattle Fire
Andrew Hendrickson	DHS/FEMA
John Slomnicki	City of Shoreline/ King CO jail
John Gates	ESCA
Dan Good	ESCA
Steve Marten	Seattle EM

Tom Manley	ADCOMM Eng.
Rex Caldwell	Kirkland PD
Fred Radovich	Motorola
Skip Osteyee	Motorola
Jeffrey Chen	City of Medina
Dick Baranzina	City of Sammamish
Jon (WIZ) Wiswell	City of Seattle
Peggy Garcia	Seattle PD
Paul McDonagh	Seattle PD

John Murray, Ray Ganner, Tom Brogelman – Federal Engineering

Project expectations:

- What security measures will be implemented to insure that information gathered during the project is protected?
- Operational and technical information should be made available to all participants.
- The project team needs to insure that information is reviewed to insure that data is not double counted.
- Need the capability to talk to other agencies during emergencies
- Utilities (electric, water, public works…) are 1st responders during emergencies but are often not considered to be part of the process.
- Process, procedures and training are important to the support of agencies during emergencies and can have an immediate impact on the process if developed and implemented.
- How will Federal agencies like the TSA, FBI and Coast Guard participate in this process?
- Agency to agency interoperability works fairly well, however when an incident requires expanded agency participation communications complexities become an issue
- Technology will not resolve operational or procedural problems.
- Identifying and documenting agencies and their communications systems and capabilities throughout the state would be beneficial information for use during emergencies.
- Each agency should be responsible to develop their own communications plan. The plans should be available to other agencies for review and use in developing their interoperability plans.
- Federal agencies operate in secure mode a majority of the time and cannot communicate with agencies operating in clear mode.
- Simple solutions covering all agencies, with sufficient training and documentation, would be more beneficial than new systems and technologies.
- Effective management of emergency procedures is necessary to insure open communications during emergencies.

- Even if there are sufficient interoperability channels available, if participating agencies are not equipped with access to the channels, interoperability may not be possible during emergencies or impossible to manage.
- Non-public safety entities responding to emergencies add to the complexity of managing incidents.
- Local jurisdictions are always first in and last out during incidents. Neighboring jurisdictions, state and federal agencies need to be able to adapt to the local jurisdictions as they join an incident in progress.
- You cannot assume that that responding agencies will have the physical equipment necessary to communicate with outlying agencies during emergencies.
- Standard naming structures are necessary to insure that responding agencies will be able to understand each other during emergencies.
- A directory that identifies PSAP's and key contacts is needed.
- Security issues can hinder interoperability.
- Aviation and Marine bands are standardized worldwide. Standardizing Public Safety bands would be helpful with interoperability.
- Staffing to support operational situations is an important consideration.
- The cost to maintain a system always grows over the life of a system

Funding:

- Local jurisdictions will have to participate in the funding of any proposed solution on a sustaining (operational) basis.
- Grant funds are long term in nature

Technologies:

- Narrow band analog technology is not a preferred technology
- P25 standards for digital systems are a good for public safety agencies and will be a part of any long-term solution.
- Digital migration is necessary, but training issues may cause local agencies support problems.
- Mobile computing offers valuable capabilities for public safety agencies.
- Mobile computing interoperability will be handled at the back-end (data bases) not on a mobile-to-mobile basis.
- Instant messaging feature is not essential.
- ICU's (patch boxes) will become a problem shortly. All agencies have this equipment; however there is no planning is in place for deployment. Agencies need to identify where they are and how to set them up or how to obtain the services of one of them for an incident.
- Gateway devices are assets that can be used in a total communications system scenario.
- Radio over IP provides an alternative transport method that needs to be planned for, prior to implementation.

Commercial Systems:

- Some agencies are using CDPD service for mobile data.
- The low entry cost of commercial systems is attractive, but on-going usage costs can be high.
- A problem with commercial services is that the agencies have no control over the systems:
    - Technologies can be changed by the service provider, forcing agencies to change their systems
    - Maintenance schedules can be difficult to manage
- Commercial systems can offer a good short-term alternative to agencies that are migrating to new systems.
- Commercial paging services offer a wide coverage area that would be expensive to duplicate
- Commercial systems can offer added features or coverage area that can augment agencies' capabilities.

Infrastructure:

- The DNR controls many sites throughout the state.
- Many commercial and DNR sites do not meet R56 standards.
- The use of existing sites does not always offer cost savings, but sharing of infrastructure can bring cost savings
- Relying too heavily on consolidated sites adds to system vulnerability.
- To make sharing of infrastructure attractive there needs to be:
    - Acceptable site security
    - Site access when needed
    - Site management of
        - Power
        - System back-up
        - Lightning protection
- Restrictions on new tower construction, is forcing more infrastructure consolidation.
- P25 Phase II will push users towards more sharing of sites.

Open Discussion:

- Expectations need to be managed. Don't oversell system capabilities.
- Keep it simple; the feasibility of the proposed system needs to be achievable.
- In a perfect world:
    - There would be no crime
    - One radio would "Do it all"
    - Software defined radios
    - Not have to worry about interfacing to "legacy" systems.

Session Overview:

This session was very well attended, with a good mix of public safety agencies, federal agencies as well as non-public safety agencies represented. Security concerns over information gathered during the project where expressed. Planning, developing operational procedures, documentation, training and standards where topics repeatedly discussed during the session. New technologies and equipment where not the center of discussion; operational issues where. The cost to modify existing systems to make them compatible with any proposed system was also a concern.

Region 7

Date: October 6, 2004

Forum Location: Wenatchee

Forum Attendees/Entity:

Dennis Hausman - WA DIS
Kim Scott – Okanogan Cty. Sheriff
Don Senn – WSDOT
Jennene Ring – WSDOT
J. Lennard Verez – WSDOT
Mats Gustafson WSDOT
Alan Hall – WSDOT
Jim Brown – Wenatchee PD
Gary Babst – Wenatchee Fire
Randy Foltz – Chelan Cty Sheriff
Patrick Lonergan – Chelan Cty Sheriff
John Fleckerstein – Rivercom
Steve Reinke – Kittcom
Don Fortier – Grant C.F.D. #3
Terri Thornberry – Rivercom
Arnold Baker – Chelan Cty. Fire
Mike Warren - WSP
Trevor Brandt – Day Wireless
Keith Cook - Motorola

John Murray, Ray Ganner, Tom Brogelman – Federal Engineering

Project expectations:

- Looking for a definition of Interoperability that is different than the broad, sweeping general "everyone can talk to everyone else"
- Interoperability is as much operational, on an incident by incident basis, as it is a system feature. i.e.: PSAP to PSAP, State, and EOC…..
- Command and Control interoperability is more important than unit to unit interoperability, in most cases.
- Every day issues must be addressed; 911 issues, technology changes, agency to agency communications
- Need help to manage issues faced with changes to new technologies
- Forest Service is using VHF narrow band. However, fire dispatch is using wideband and can't communicate with them. This is a problem during fire season.

- County fire service chiefs meet on a monthly basis to discuss operational issues.
- Need regional communications plan and training on how to support/implement the plan on a local level
- Need alternative communications paths between communications centers to guarantee system availability during emergencies
- Statewide communications frequencies need guidelines for their use and usage needs to be monitored, so the guidelines can be enforced
- Channel congestion makes it difficult to monitor traffic at dispatch centers

Funding:

- Funding issues are a problem because many times available funds are allocated to items that are attractive rather than critically needed.

Technologies:

- Counties use different proprietary system technologies which cannot communicate with each other as well as system types such as trunked vs. conventional.

Commercial Systems:

- Commercial system interference with private systems is a problem
- Command and Control supervisors use cellular systems during emergencies
- VHF radio system is used for field communications support during emergencies
- Cellular coverage voids are a problem
- Multiple Commercial vendors in the area have different coverage areas which can make knowing where you have coverage confusing
- Satellite services are used in remote areas
- Cellular services are not completely reliable during emergency situations
- System capacity is a big issue during emergency situations
- Procedural solutions can help these situations
- Satellite phones usage is expensive and they are only used during emergencies
- During emergency situations cellular providers are sometimes asked to provide handsets for public safety support, which they do provide.
- Cellular providers have supplied temporary l sites to enhance coverage and system availability in emergency situations
- ARES Armature Radio Emergency System also helps during some emergency situations and is very important in small rural agencies.
- Hospitals are equipped with Armature Radio capability

- Cost is an issue in determining the use of commercial system infrastructure sites
- Infrastructure site availability at commercial sites is sometimes the only available option
- LERN Law Enforcement Radio Network could be more effective if was better managed and controlled

Standards & Technologies:

- Communications is often a major issue during incidents covering multiple agencies
- A common frequency that would be available and managed for emergency use would improve support
- Super Net is comprised of 7 counties in central Washington with interoperability that is in use today
- Vendors need to standardize on programming software, accessories, cables, etc….
- Reprogramming radios is a big issue
- Mandatory migration to narrow band requires a lot of planning
- Statewide standards need to be implemented to:
    - Address formats used
    - Call protocol
    - Order model
    - Military standards
    - Clear text for fire services
- Standards reduce the training burden on agencies
- Accreditation is a good selling point to support standard implementation
- The introduction of different radio brands adds to the complexity of maintenance
- Video is used over micro wave systems
- Video over mobile data will be piloted soon
- WSDOT is exploring a “Smart Plow” application using streaming video.
- State Patrol is not currently using any of the new technologies discussed
- 4.9 GHz data services are being considered for use by RiverCom
- There is a control issue with agencies using PUD and fiber networks that is inhibiting PSAP’s use of them.
- Most agencies are using compatible CAD systems
- AVL is being used by several agencies and will be implemented by many others in the next few years
- Limited coverage area and cost makes commercial services unattractive for use
- Paging systems are privately owned by the agencies using them

Infrastructure:

- Microwave systems are generally shared by agencies

    - KITAITAS built a site WSP/WSDOT uses in exchange KITAITAS is allowed to use WSP system
- Expanding agreements to share fiber facilities are in process
- Sharing of infrastructure facilities is a trend that is expanding
- Cost and process issues are forcing these efforts to expand
- DNR issues add to the complexities of these processes, for example protected wilderness lands
- Tower construction process can take years
- Because of cost and available sites adding towers is usually not an option
- It is preferred to own infrastructure sites for control purposes
- Grant county uses microwave from Day Wireless and PUD fiber
- Commercial sites would be more attractive if the service provider offered:
    - Security
    - Cost incentives with rent caps
    - Facilities for fixed end equipment
    - Environmental control
- Environmental impact studies must be completed for proposed antenna sites
- There needs to be a state clearing house with available sites so that counties could easily identify potential sites for their systems

Above Line A:

- The process for frequency assignment is burdensome and takes years to get resolved.
- The 1st application for frequency assignment is always turned down by the Canadian agency
- Interference is a problem. In Canada VHF frequencies are used by commercial users. Some of these frequencies are used by Public Safety agencies in the U.S.

Open Discussion:

- Radio systems broadcasting with high wattage output is a problem in the region.
- Improved communications between agencies is needed
- Video capability in mobiles would be a benefit
- Data services can make an agency more efficient
- Dispatch Center consolidation could bring efficiencies and reduce costs
- Control issues inhibit progress
- Dynamic regrouping of communications capabilities would be a benefit
- Smart Link capabilities would be beneficial
- Adding staff to support new systems and equipment is usually ignored. This makes new services difficult to implement and maintain
- Wide angle Streaming Video of an entire incident area would be a useful feature

- Wireless video surveillance capabilities can be useful
- Dynamically reconfigurable communications systems and communications paths would be a real benefit during emergency situations
- Wireless GIS download capabilities from CAD it would be a benefit

Session Overview:

This session was much better attended than the first session in Spokane and represented many more agency types. The interaction was lively and the participants where willing to discuss issues and solutions. There was some understanding of new technologies that are or will be available and the discussions centered on current technologies; such as trunked and conventional communications systems.

Region 8

Date: October 7, 2004

Forum Location: Pasco

Forum Attendees/Entity:

Dennis Hausman - WA DIS/SIEC
Don Marlatt - Walla Walla EMD
Robert D. Bass – Lockheed Martin
Mac Knight – Hanford Fire Dept.
Nancy Jackson – WA DIS
Ron Hales – Franklin F.D. #3
Kevin Scott – Franklin County Information Services
Fred Klauss – WAST EMD
Mike Heinbogne – Kennewick Police
Bob Kirk – Kennewick Fire
Don Olson – Regional Tec Initine
Tony Miller – American Medical Response
Walt Hoffman – WSDOT
Mike Gousse – WSDOT
Michael Foisy – WSDOT
Doug Hutchion – Klickitat County Fire
Jeff Ripley – Benton County Fire District #1
Ron Duncan – Richland Fire Department
Dave Brotherton – Klickitat Fire District #5
Peter Mercer – Klickitat Fire District #10
Ken Irwin – Yakima County Sheriff
Jim Hall – OME Yakima
John McIntosh – Dept. of Fish & Wildlife
Valerie Eveland – Benton County Emergency Services
Michael Namchek – WSEMD
John Fifer – Pasco Fire Dept.
Pat Hogan – Franklin County Sheriff Office
John Scheer – Franklin County Emergency Management
Gummada Murthy – WSDOT
James Todd Daley – WSDOT
Jim Mahugh – WSDOT
Rick Ringer – Yakima 911/Comm
Wayne Wantland – Yakima 911/Comm
Vikki Peterson – City of Walla Walla
Dan Aycock – City of Walla Walla 911
Bob Spencer – Benton County E.M.
David Havens – Hanford IT

Bill Holesworth – Radio Service Co.
Bill Campbell – Day Wireless
Fred Radovich - Motorola
Marlon Johnson – Day Wireless
Keith Cook - Motorola

John Murray, Ray Ganner, Tom Brogelman – Federal Engineering

Project expectations:

- Will agencies other than police, fire and EMS be included in this project?
- It is expected that Public Safety responders will be able to communicate state wide when this project is completed.
- Is this project being coordinated with federal agencies?
- Integrated Wireless Network (IWN trunked VHF system) supports Homeland Security communications between agencies that are covered.
- There needs to be a plan that coordinates radio communications system procurement and implementation so that the systems are compatible.
- Issues go beyond county to county and sometimes go beyond the state line.
- A simple plan that identifies frequencies to use on a county by county basis would be a good start to eliminate interoperability problems.
- WSDOT is relying more on data systems rather than voice for information gathering.
- On going maintenance costs of any new system must be identified and planed for as part of the system.
- Local jurisdictions will control weather or not they participate in this project.
- Many local systems have serious operational issues that need to be addressed.
- Operational issues need to be identified before system solutions are designed.
- Communications between like agencies (fire to fire, police to police) are critical during emergency situations; communications between other agencies (fire to police) are not.
- On Seen Command and Control (OSCAR) uses DOT controlled narrow band analogue frequencies that are used during emergencies.
- Integrated departments (Police, Fire & EMS) have complex issues that need to be coordinated.
- Simultaneous multiple incidents must be supported by communications systems.
- Point to point communications (talk-a-round) is an essential requirement during emergency situations.
- System requirements differ from region to region as well as within a region making a “one size fits all” solution impossible to implement.

- A simple method for agencies to identify available resources; sites & towers, loading, capacity, etc. is needed to assist local agencies in communications system design, implementation and maintenance.
- Operational procedures must be addressed as part of the overall system design process.
- Coordinating the different agencies involved (police, fire & EMS) is a complex problem. Offering services that are needed and affordable will help overcome these issues.
- Capacity on demand is a requirement for any new system.
- Equipment that becomes available because of replacement should be communicated to other agencies for possible use.
- There is a requirement to have interoperability between data systems as well as voice systems.
- Will frequency use be looked at during this project and will a frequency reuse plan be developed?

Funding:

- Funding issues at a local level are a serious concern.
- Funding needs to be available to enable counties to procurer needed communications systems.
- Funding must cover operational costs for the system
- Agencies have a big investment in their current systems and would need funding to move to new communications systems.
- It is essential that enough time is given to participating agencies so that they can secure the required funding for any new system

Technologies:

- The cost of digital equipment is too high and the life of the equipment does not justify an investment in it at this time.
- P25 phase II will address many issues faced today, but the implementation timeframe is too far out to offer immediate help.
- Many agencies are taking a “wait and see” attitude on digital migration.
- Proprietary protocols are not acceptable.

Commercial Systems:

- Commercial systems are not reliable enough to be depended on during emergencies.
- Wireless priority service helps
- Use of commercial systems during emergencies is discouraged because it is not secure.
- Coverage outside of urban area is not good enough to be depended on during emergencies.
- Public Safety needs are in conflict with the goals of service providers.

- Capacity, coverage and priority service are the issues that must be addressed to make commercial services more attractive to public safety users.
- During emergencies cellular systems are generally not available.
- Public paging systems are used by some agencies.

Infrastructure:

- Towers are generally shared between agencies
- Availability of sites is very limited and there is no mechanism for identifying available facilities
- Security at commercial sites is an issue

Open Discussion:

- In order to solve interoperability problems communications systems need:
    - To be seamless and automatic
    - Provide adequate training
    - Be funded to the extent to allow local agencies support and maintain them properly
    - Have 1 device that does all
    - Free of infrastructure limitations
    - Have the capability to allow users to talk to anyone, anytime and anywhere.
    - Have wideband data capability
    - Be managed to prevent abuses
    - Be IP based

Session Overview:

This session was by far the best attended of the first three forums. The agencies were well represented and held open and well informed discussions. There was a good understanding of new technologies and how they should be used in next generation systems. Funding and local control where a major concerns, more so that at the two previous sessions.

Region 9

Date: October 5, 2004

Forum Location: Spokane

Forum Attendees/Entity:

Dennis Hausman - WA DIS/SIEC.
Gerry Fojtik - Spokane Cty. Sheriff
Chuck Chisholm - Spokane Cty.
Bob Wentworth - City of Spokane
Judi Carl - Spokane PD
Joann Boggs - Pereloreill Cty. Emergency Management
Roger Trump - Columbia Cty Emergency Management
Jon Weise - Adams Cty. Emergency Management
Ken Heale – WSDOT Eastern Region Traffic
Craig Clouse - WSDOT Equipment Operations
Charles Bussell – US Customs & Border Protection
Douglas Cole – Spokane Cty. 911/Dispatch Center
George Shoemaker – Day Wireless
Keith Cook - Motorola

John Murray, Ray Ganner, Tom Brogelman – Federal Engineering

Project expectations:

- System interface with other counties and agencies is very important. Counties need to know how to interface with WSP, surrounding counties, LERN, OSCARR, NLECT….
- Blackout or dead coverage areas are serious problems
- The city and suburban areas have interoperable channels but rural agencies do not have the capability to communicate with them.
- Dispatchers need the ability to monitor incidents as they are developing
- Training must be available for all agencies that participate in the system.
- Lack of training is a serious inhibitor to interoperability. A venue has been created to address training issues; however it is unproven at this time.
- Will participation in the system be on a voluntary basis? How will funding issues be handled?
- The system must be capable of interoperability with other State Agencies.
- Will any private sector entities participate in the system? Site development?
- Interoperability is supported on the current systems by adding radios that operate on adjoining systems in dispatch centers. This is managed on a local level.

- Local agencies want to manage and control their systems
- During a recent homeland security system drill at a dam with multiple agencies involved (local, state federal and Canadian) the communications systems where a significant problem.
- How will groups be identified to be included or excluded in the system for interoperability?
- On-going, mandatory system training is imperative.
- Communications is always the one issue that prevents effective interagency operations during exercises.

Funding:

- Federal funds are used to support the county systems and the use of these funds are directed to specific functions
- Federal funds must be used by a specific date or be lost, forcing agencies to spend money without adequate planning
- Funding is available for exercises, but not to evaluate exercise results.

Technologies:

- Vehicle location is important to DOT, Spokane County is adding AVL to cars and the Fire Department is using AVL
- Spokane has its own Mobile Data system that covers the city and county
- Broad band data capabilities are available on a limited basis. These capabilities are important in the urban area, but in rural areas these capabilities are not as important.
- Coverage issues and cost are prohibitive factors for mobile data in rural areas.
- The P25 vocoder is an issue and is not viewed as an acceptable alternative. Analog performance is preferred over digital.
- Mobile data/CAD/AVL integration is underway by the city fire department
- Video capabilities would be beneficial
- Coverage area is an issue for mobile data systems in the rural areas

Commercial Systems:

- Cellular capabilities have declined in the city
- In the city cellular is only used as the 3rd line of support for communications after private radio and mobile data
- Cellular coverage in rural counties is minimal
- In some cases cell phones are used by the command structure to set up operations on a point to point basis
- EMS uses cell phones to talk to hospitals as the primary means of communications.
- During big emergency situations the cellular systems busy out. land base phone systems also busy out during these situations, as well.

- CDPD was used by the fire department to support mobile data applications, but the carrier discontinued the service.
- The fire department relies on their private paging system to support their primary dispatch needs.
- Because the municipalities do not have control over coverage, availability, priority access or capacity of commercial systems, it is unlikely that they will be relied on as the primary source for public safety communications support.
- IP capabilities are becoming more important.
- Encryption feature required in limited circumstances.

Infrastructure:

- The city and county microwave system is shared and migrating to digital
- WSP shares a few microwave sites with Spokane County
- The fiber network is a combination of owned and leased lines
- Rural agencies are sharing sites with the State
- Space rented from private companies needs to be environmentally suited for private systems with adequate heat, cooling backup power, etc….
- Antenna tower space management is a problem.
- The costs to build on leased land are less than to rent site on existing state tower sites.
- Commercial cellular antenna site facilities are usually not acceptable for public safety system usage

Above Line A:

- Frequency coordination is a very long process that typically takes one to two years
- The Canadians usually reject the 1st application for new frequencies; eventually persistence will usually prevail
- Full scale exercises include Canadian agencies

Open Discussion:

- What will the survey cover?
- Training needs to be a high priority
- Political boundaries will be difficult to overcome
- Digital system coverage wall (Drop from coverage area rather than analogue fade) is a disadvantage.
- Would prefer a narrow band analogue system to a digital system.
- Narrow band allows for more talk groups (users) in the same band width.
- Radio ID and remote “kill” are important features
- Radios with the capability to support multiple features such as voice, data text messaging and interconnect are needed.

- A radio with features that would allow the user to eliminate devices like pagers and cell phones is desired.

Session Overview:

Considering the location (Spokane), the session was lightly attended; there was no representation from Fire agencies. This may have been due to the notifications not being received. The input was good, tending to be more factual than strategic. Concerns that were expressed were more of an operational nature rather than strategic or long term.

Appendix 2 - Current Issues

Details of issues expressed by stakeholders in forum meetings and interviews are provided here. They are categorized in areas of *technical*, *operational*, and *process*.

Technical Issues

Disparate radio systems (UHF, VHF, 450 MHz, 800 MHz, trunked, analog, digital) are incompatible.

- P25 versus non-P25 determinations and guidance has not been determined.
- Narrowband migration has not been accepted and is not being coordinated across all agencies.
- There is no strategy for discontinuance of wideband analog systems.
- Hybrid solutions for UHF, VHF, 800 MHz, 700 MHz, and 4.9 GHz systems have not been identified except in very limited cases.
- A consolidated strategy for potential use of satellite communications (and how to integrate this capability) has not been articulated.
- Communications with Federal and DOD agencies is poor or non-existent due to different technologies.
- Backwards compatibility standards are non-existent.
- Critical Police-Fire communications, 24X7, is not always available.
- Gateway device management is not being conducted.

Radio coverage and capacity is not consistent statewide or countywide (regionally).

- Statewide/countywide voice and data transfer capability is not consistent (data transfer is severely limited).
- There are field-to-center and field-to-field radio dead spots.
- Rural area coverage is poor.

- Communications with airborne resource services is poor or non-existent due to different technologies.

- Canadian frequency licensing causes interference and excess signal strength.

Statewide infrastructure is not supporting all geographic areas or county and local communications.

- Statewide tower resources are not being coordinated for use by county/local agencies.

- There is no tower management for infrastructure sharing. A collaborative approach to infrastructure sharing has not been institutionalized.

- Underutilized tower capacity has not been identified for redistribution across the State.

- Radios and other material assets are not shared from "haves" to "have-nots".

- There is no commonly available strategy and process for State infrastructure to support local agencies, and vice-versa.

- Site/tower information is difficult to obtain. Lease, owner, location, fees, and availability information is not widely available.

- Commercial systems do not provide adequate security, reliability, and availability for public safety use.

- Microwave systems for State agencies are being duplicated (not coordinated).

Frequency management and frequency sharing is not coordinated across the State.

- Planning for new systems has not always allowed for forward and backward compatibility across the State.

- A statewide solution for communication between 800 MHz systems has not been identified.

- A decision to identify statewide frequency management authority has not been determined by the SIEC.

- Underutilized frequency capacity has not been identified for redistribution.

Future technologies

- Technical migration plans are not coordinated between agencies, regions, State.

- Strategies for narrowbanding, 700 MHz, 4.9 GHz, and VoIP migration, and compliance with NIMS directives are being coordinated at various levels within regions and agencies, but not on a standardized statewide basis.

- Mobile data and GIS location technologies are not being standardized and coordinated.

Operational Issues

Public safety responder communications interoperability is lacking.

- A statewide system security plan is not in place.

- Common operating procedures for routine and task force operations are not available statewide.

- Multiple vendor solutions cause interoperability hurdles.

- Coordination of communications procedures across all geographic boundaries has not been memorialized.

- There is no statewide common standard operating procedures/concept of operations (SOP/CONOPS) with tailored tracks for local government.

- Communications requirement for the upcoming Olympics have not been coordinated statewide.

- Data transfers and sharing (how, what, when, and to whom) have not been agreed to.

- Border communications issues (inter-state and national) have not been resolved.

- “Line A” issues are not being adequately addressed and resolved.

- Interface and communications with Federal agencies is not being coordinated, particularly when Federal agencies operate in secure mode.

- Interface and communications with military bases and organizations is not being coordinated.

- Interface and communications with utility companies is not being coordinated.

- Turf and trust issues at both the State agency and local entity levels have not been adequately addressed and resolved.

PSAP dispatch and communications capabilities are diverse and inconsistent.

- A PSAP consolidation plan (regional, countywide, and Statewide) has not been orchestrated by the SIEC.

- Duplication of communications systems is causing high operating costs and decreased efficiency across the State.

- PSAP communications are inadequate to handle more than home agency response.

- Backup communications capabilities between centers are not always available.

- Regional and Statewide coordination with Federal and DOD stakeholders has not been standardized.

- CAD interoperability does not exist.

Communication and coordination of strategies and purchases are stove-piped across agencies and regions.

- Planning for new systems is not coordinated with other local, county, and State systems.

- Vendor, implementation, standards, and other project information is not being shared with other agencies.

- Funding initiatives are not coordinated and leveraged where common procurement is anticipated.

- Best of breed solutions are not being identified for reuse by other agencies.

- There is no statewide clearinghouse of ideas, programs, strategies, or information.

- Surplus and redundant equipment is not being made available to smaller agencies that could benefit from basic communications systems.

Scarce funding resources will not accomplish ideal interoperability.

- There is no coordinated, statewide funding process.
- Agencies are not apprised of all funding sources and alternatives.
- There is no overall control of the State and Federal grant application process, causing administration and oversight costs to be high.
- Grant matching funds are often not available by agencies and may preclude application.
- Equipment grants generally do not allow for implementation, training, and maintenance costs.
- There is no consolidated funding authority.
- There is no best of breed grant application process that would maximize opportunities for award.
- Rural areas are not receiving a fair share of available funding.
- Use of commercial systems and infrastructure is too expensive.

Process Issues

A statewide governance plan has not been instituted.

- State versus local control over interoperability issues and systems has not been resolved.
- Oversight authority to bridge the cultural gap (State agencies looking forward, local agencies focusing on basic needs for today) has not been identified.
- SIEC governance does not have the authority to adequately oversee statewide implementations.
- Divergent policies and operational issues hinder communications between agencies.
- Multi-jurisdictional training is not conducted frequently enough.
- Interoperability decisions are not being made by primary police, fire, legislative, and State decision-makers.

A consensus approach to regional and statewide issues has not been adopted.

- A common set of terms and definitions is not available.
- Roles and responsibilities for State, county, local, legislature, and other stakeholders have not been adequately defined.
- Universal stakeholder commitments to achieving interoperable communications have not been achieved.

Coordinated requirements planning have not been conducted statewide.

- A best of breed implementation program has not been instituted statewide.
- Inter-State, intra-State, and national successes have not been published and standardized.
- Program and procurement information is not being coordinated statewide.
- A hierarchy of critical statewide systems has not been coordinated.
- Managerial, technical, and administrative resources are not being effectively utilized across all agencies.
- Best of breed practices are not being adopted.

A statewide system lifecycle plan has not been instituted.

- Procurement, implementation, maintenance, and reconstitution standards have not been devised across the State.
- A statewide system migration plan has not been articulated.
- State versus local agency standards resolution plans have not been developed.
- A minimum acceptable level of interoperability for all stakeholders has not been determined.

Appendix 3 - Governance Models

Review of Washington State SIEC

The Washington SIEC has made significant progress toward becoming an effective statewide interoperability organization, including statements of Vision and Mission, a regular meeting schedule with prepared agendas, a well-defined membership, and a set of Guiding Principles. Many SIECs have not addressed these issues as early in their process as Washington has. For reference, these definitions are outlined below:

Vision Statement

Public safety officials throughout Washington are able to communicate using interoperable technology in real time and on demand.

Mission Statement

In the interests of public safety, the State Interoperability Executive Committee (SIEC) pursues and promotes statewide interoperability policies and standards, which will ensure interoperable emergency communications.

Meetings

SIEC meetings have been scheduled quarterly in 2004. In 2005 they have been scheduled bi-monthly. All meeting announcements, minutes, briefing papers, presentations, and audio notes are posted on the SIEC's web site at http://siec.wa.gov.

Membership

The membership must include, but is not limited to, representatives of the following organizations (15 members):

1. Military Department.
2. Washington State Patrol.
3. Department of Transportation.
4. Department of Information Services.
5. Department of Natural Resources.
6. State Emergency Management Directors.
7. Local Emergency Management Directors.
8. City Governments.
9. County Governments.
10. State and Local Fire Chiefs.

11. Police Chiefs.
12. Sheriffs.
13. Fire Marshall.
14. Vacant
15. Vacant

Duties and Responsibilities of the SIEC

The Washington SIEC duties and responsibilities are:

- Develop policies and make recommendations to the Information Services Board (ISB) for technical standards for State wireless radio communications systems. The standards must address, among other things, the interoperability of systems, taking into account both existing and future systems and technologies.

- Coordinate and manage on behalf of the ISB the licensing and use of State-designated and State-licensed radio frequencies, and serve as point of contact with the FCC (Federal Communications Commission) on matters relating to allocation, use, and licensing of radio spectrum.

- Seek support, including possible Federal or other funding, for State-sponsored wireless communications systems.

- Develop recommendations for legislation that may be required to promote interoperability of State wireless communications systems.

- Foster cooperation and coordination among public safety and emergency response organizations.

- Work with wireless communications groups and associations to ensure interoperability among all public safety and emergency response wireless communications systems.

- Perform other duties as assigned by the ISB to promote interoperability of wireless communications systems.

SIEC Advisory Work Group (SAW)

The SIEC formed the SIEC Advisory Working (SAW) Group. The SIEC allows SAW to create other working groups on an ad hoc basis. The SAW Group was chartered by the SIEC to assist with the following areas:

- Identify legislative barriers that hinder statewide interoperability.

- Monitor the FCC and other rule-making agencies for rules and legislation that may impact interoperability.

- Research and develop policy recommendations for the SIEC.

The SAW Group meets regularly on a biweekly schedule. Early on, they realized the need for other critical functions in their effort. These included the areas of frequency coordination, standards and architecture, planning and assessment, and funding. As a result, the SAW Group created the following groups:

- SIEC Technology Clearinghouse.

- Technical and Frequency Management (TFM) Work Group.

- SIEC Advisory Funding Enterprise Working Group (SAFE).

SIEC Technology Clearinghouse

It is the responsibility of the Technology Clearinghouse to provide an opportunity for vendors to showcase their technology advances in interoperability to those participants who are interested. It is the intent of this assembly to provide equal access to all technology that is brought to the attention of the SIEC.

Technical and Frequency Management (TFM) Work Group

The Technical and Frequency Management (TFM) Work Group was chartered by the SAW Group to assist in the following areas:

- Identify technologies that could be used by the State of Washington to promote interoperable communications.

- Develop a frequency use plan that will promote spectrum efficiencies.

- Assist the SIEC and SAW Group in the technical requirements of interoperability within the State of Washington.

Membership in this committee is by appointment by the SAW Group.

SIEC Advisory Funding Enterprise Working Group (SAFE)

It is the responsibility of this working group to explore potential funding sources, for those activities and initiatives required by the SIEC, in order to meet its operational and legislative mandates. This will include but not be limited to:

- Federal funding.
- State funding.

- Grants.

Staff

There is one individual assigned to the SIEC to provide support. This individual is a member of all subcommittees and coordinates all SIEC efforts and activities.

Models from other States

States that have successfully built or are building Statewide of multi-jurisdictional public safety radio systems were researched on the question of governance. Some of the resulting organizations were formed through legislation, some were created by Executive Order and still others were developed on an ad-hoc basis. Regardless of how they were created they share a common mission of insuring that the public safety radio communications systems under their jurisdiction work well and are interoperable.

To accomplish the mission, oversight boards take similar paths, but have structures that reflect functions that are appropriate for the locale served. Some paths have been long in development but have yet to reach fruition. On the issue of governance. In January of 2004, the State issued an enterprise standard for public safety radio which includes the endorsement of P25. At this time, the State is planning a seventeen county metropolitan regional system as a demonstration project, and is seeking Federal Grant funding to build it. Based on conversations with many of the State representatives, supplemented by information gathered by the NGA Center for Best Practices in Washington, DC, some examples of successful projects and the oversight structure employed are as follows:

CapWin

While not a state model, the Capital Wireless Integrated Network (CapWin) is a multi-jurisdictional wireless public safety system. It is a partnership serving communities and agencies from Washington, DC, Maryland, and Virginia, working together to develop an integrated mobile wireless public safety and transportation system.

CapWin's strength lies in its governance structure, which is representative of all its stakeholders. The Project Steering Group was established to provide oversight and consists of nine members from State, local, and Federal agencies, including law enforcement, emergency medical services, transportation, and public works. The Steering Group exercises routine oversight responsibilities, but defers to the executive group on matters of policy. The Project Executive Group is a thirty-two-member body representing State, local, and Federal agencies from fire, police, emergency management, medical services, transportation, and publicly elected officials. This group facilitates the implementing of policies based on input from the Steering Group.

Colorado

Oversight and authority for building a statewide public safety voice radio system was contained in the enabling legislation creating the Public Safety Communications Trust Fund. This Act placed the responsibility for administration of the trust fund, which was seeded with $50 Million, with the Executive Director of the Department of Personnel, and set forth criteria to be considered by the Executive Director to consider when carrying out this function.

The Executive Director was required to:

- Develop bid specifications for acquiring radio communications equipment for State entities.
- Adopt rules for the participation of State and local government agencies in, and distributions from the trust fund.
- Account for all activities in connection with the trust fund and report annually to the Governor, the Legislature, and State auditor.
- Adopt recommended standards for replacement of analog radio equipment with digital radio equipment in the Department of Public Safety.
- Adopt recommended standards and establish a timetable for the replacement of radio telecommunications equipment with a system that meets certain FCC requirements as they relate to the telecommunications needs of State agencies

The act also required the Department of Personnel, Division of Colorado Information Technology Services, to develop and implement a two-way radio (digital trunked radio) system for voice communications for State and local governmental agencies. In this way, Colorado chose to place system implementation with its own technology group.

Idaho

The Idaho Statewide Interoperability Executive Council was formed by Executive Order in August 2003. Eighteen members were named to the SIEC representing various organizations within the State. (See Table 4) As part of the Executive Order the SIEC's membership was selected by the groups they represent and approved by the Governor. The SIEC may add additional member agencies as deemed appropriate.

The Idaho SIEC developed materials to inform and educate the various agencies throughout the State. Their Outreach subcommittee produced a DVD and

regularly attends professional association meetings to educate and inform local personnel Statewide of current SIEC activity.

They are considering P-25 at 700 MHz as their technology and want the users to dictate the system design. The SIEC has not made any decisions concerning technology or implementation strategies. They remain in the midst of performing a statewide infrastructure assessment. A digital microwave system was completed in 2003 to provide service for public safety and distribution of digital broadcast television.

Funding alternatives being considered include the Department of Homeland Security and other Federal programs. 911 fees are limited to 911 services only and the current code would need to be amended to use them for any other use.

Illinois

Illinois created a Terrorism Task Force (ITTF) in 2002, a policy making body of fifty-four voting members. The Task Force forges consensus through the work of subject matter experts organized into twelve standing committees and eight working groups to those committees. The Task Force meets each month and its committees report on significant activities and issues discussed and acted upon at committee meetings. Projects that originate from a committee or several committees working together receive budget allocations from the SHSGP award for the State. The budget for funding strategic priorities of the State, subdivided into State and municipal shares, emanates from this process.

Interoperable communications is one of the top priorities of the ITTF for 2004. The ITTF communications plan includes:

- Buying and strategically placing throughout the State nine mobile interoperable communications suites capable of patching various responding frequencies together.

- Completing the Illinois Regional Emergency Access Channel (I-REACH) system in the 20 counties currently without I-REACH.

- Putting emergency radios at all key regional hospitals.

- Beginning distribution *STARCOM 21* 800 MHz interoperable radios to every police, fire, emergency management, and public health department in the State if that system comes online in 2004.

Indiana

Indiana created the Integrated Public Safety Commission (IPSC) in 1999, and it has been a key factor in winning support from local jurisdictions. The twelve-

member IPSC provides structure to the State-local relationship. Under the management of the IPSC, the State is constructing the backbone infrastructure of a statewide interoperable radio system, and the local agencies are required to purchase their user equipment. There are no user fees, a plan that is favorable to the local agencies.

The IPSC Director of Implementation shared his insights with ***FE*** on the progress of building the statewide radio system. IPSC was created without any staff, and today has only seven staff members. This has been a limiting factor in deploying the system. Funding has been secured through a tax on motor vehicle fees. End-user support has increasingly developed during the project. The director indicated that he would have had more local involvement from the beginning, which would have facilitated the design and support. Although the IPSC was given bonding authority it has not had to use it. Beyond that the State financial experts do not feel comfortable the repayment model using motor vehicle taxes.

Michigan

Michigan's Public Safety Communications System (MSPCS) is operated by the Michigan Department of Information Technology (DIT). The MSPCS Statewide 800 MHz P-25 system went online in 1996. The Motorola ASTRO 25 6.0 Platform digital 800 MHz trunked radio network became fully functional Statewide in November 2002. A MPSCS State Advisory Board composed of fifteen member representatives acts as an advisory panel to DIT.

The MPSCS State Advisory Board is charged with responsibility for review and recommendations regarding member fees including non-payment of fees, future MPSCS system features and enhancements, review and advise on customer service complaints, non-performance issues and potential member termination because of abuse of member privileges and/or non-payment of member fees. MPSCS has fixed user fees including a one-time activation fee of $25 per radio for training and programming and an annual fee of $200 per radio.

Key to the State-local relationship is the MPSCS Membership Agreement that details:

- System operations and performance levels.
- State responsibilities.
- Member fees and responsibilities.
- Relationship management.
- Dispute resolution.

The MPSCS is a mature system with 336 federal, State and local public safety agencies with approximately 11,500 radios on the system. The number of units on the system will nearly double with addition of the City of Detroit next year. The

MPSCS has worked through many implementation and operational challenges and can provide years of practical examples for Washington to consider.

Minnesota

Legislation in 1995 created the Metropolitan Radio Board (MRB) to build a radio system to serve the counties in the metropolitan Minneapolis – St. Paul region. The successor to the MRB is the **State Radio Board** (SRB). It consists of 21 members representing State, Metro and Rural interests and serves as the statewide oversight group. (See Table 4) The MRB will transition to a regional oversight group. The SRB established advisory groups for planning, design, implementation and administration of an 800 MHz digital radio system to provide 95% portable coverage throughout the State. Implementation and operations for the statewide system is placed under the Office of Electronic Communications in the Department of Transportation.

With creation of the SRB was the name given to the Statewide system effort; Allied Radio Matrix for Emergency Response (ARMER). In addition a digital microwave backbone will be constructed to support the trunked communications network.

Phase 1 is complete with a P-25 digital 800 MHz infrastructure for the City of Minneapolis and three counties. The project is currently in Phase 2 which includes system enhancements to improve indoor coverage within the metropolitan areas by the construction of additional sites. $27M for Phase 3 funding was to be generated from the sale of Revenue bonds backed by a $.04 surcharge on 9-1-1 fees and $6M from Homeland Security funds. Currently this 9-1-1 fund has a deficit of about $6M due in part to a short fall in projected wireless fees. The SRB is researching alternative funding sources. Meanwhile the start of Phase 3 has been delayed.

Membership in the network is voluntary and currently there is a small initial fee of $45 is per unit. This charge is intended to cover the costs of utilities, leasing and other costs related to infrastructure. All members purchase their radios.

Minnesota is building on the history of its Metropolitan Radio Board and the lessons learned from that project as it seeks to expand the public safety 800 MHz trunked radio system.

Montana

The Montana Statewide Interoperability Executive Council was formed by Executive Order in June of 2002. The Council has sixteen members appointed by the Governor which represent 14 agencies with in the State. (See Table 4)

A Technical committee was established to define a strategic operational plan, definition of standards, protocols and system components and a review of existing plans.

A governance committee was established to define the stakeholders and membership, evaluate and review lessons learned from other States.

The SIEC provides educational opportunities at local events to learn about P-25 and the technologies involved. They publish a newsletter and attend meetings and events throughout the State.

Montana is moving towards a P-25 trunked and conventional solution. Implementation will likely be done in phases that are driven by funding deadlines. The Northern Tier Interoperability Project (NTIP) and Southwest Interoperability Project (SWIP) are VHF and support legacy and advanced digital modes of operation. A microwave backbone to support these installations is also being constructed.

Interoperability plans within the State will be determined as new systems are installed. Correspondence with Border States has been limited to date. There has been some dialog with North Dakota on mobile data and they believe Idaho is going 700 MHz. The NTIP will provide secure voice communications with Local, State and Tribal law enforcement.

Purchases in Montana will be dependent on Federal dollars using Homeland Security and Office of Domestic Preparedness Funds. 911 fees are not a likely source of project funding in Montana.

Nebraska

The Statewide Communications Alliance of Nebraska (SCAN) was established by the Nebraska Legislature in April 2002. It is composed of nine members appointed by their respective agencies representing various agencies within the State. (See Table 4)

SCAN organized a strategic planning committee to develop a mission Statement, organization chart and a strategic plan for implementation. They formed subcommittees to address outreach, education, financing and users.

SCAN developed a questionnaire as a tool to obtain relevant user group data, conducted user group meetings and attended special events across the State for City, County and State entities as well as public power utility facilities to gain as much information as possible to meet user needs and operability requirements. Compilation of user input is expected to be complete early in 2005. Nebraska plans to use the installed base of microwave facilities as much as possible. This will include the use of public networks.

SCAN considered spectrum, coverage, technology Recently SCAN approved a Statewide Communications Plan to provide an integrated 800 MHz digital, trunked, Statewide voice and data public safety radio communications system that will allow direct inter-agency, and intra-agency communications among various public safety agencies at the State, county, and municipal levels of government, and with fire districts, and public utilities. Mobile Data Communications System (MDCS) portion of the integrated system will utilize shared 25 kHz channels operating in the 800 MHz band.

SCAN has developed a comprehensive system specifications document that outlines several interoperability approaches to aid local planners as they design their communications systems. Standardized system and interoperability approaches allow for both local flexibility and statewide coordination.

Ohio

Ohio's Multi-Agency Radio Communications System (MARCS) was legislated in 1994. Legislation created a MARCS Steering Committee, composed of the directors of the major user agencies, to support the director of the Department of Administrative Services (DAS) in the procurement, management and operations of MARCS. Local and federal entities are now included on the Steering Committee. MARCS serves all law enforcement and public safety entities across the State. MARCS offer different types of fee-based access including: mobile voice, mobile data and computer-aided dispatch/records management system. The Information Technology Services Division/DAS provides project management, implementation and operations support for MARCS. Ohio placed responsibility for its system in the existing State technology division.

Oregon

The Oregon State Interoperability Council (SIEC) was established by Executive Order in September 2002. The Governor appointed fourteen members from various organizations.

The Oregon SIEC has created a Strategic Plan which concentrates their efforts on three goals:

- Identify and develop a leadership structure that provides for statewide interoperability, including governance, policy, guideline and legislation recommendations.

- Establish a comprehensive approach to implementation of technology and standards.

- Foster collaborative partnerships to maximize resource sharing.

The Plan identifies several supporting actions and responsible party for each goal.

The Technical Committee has produced a document with short-term recommendations for interoperability. It is a twelve-point document maintained and periodically updated to assist local agencies in maintaining the SIEC's interoperability goals when making short term purchasing decisions.

There has been a large effort by the Awareness Committee to educate and obtain user input through meetings and events for League of Cities and Counties, Chiefs of Police, Sheriff and Fire organizations. They are also inviting APCO, NENA, and State agencies to attend these events.

The SIEC has launched a collaborative effort to maximize interoperability with existing systems as their first step. To better understand the State's requirements an extensive radio survey has been launched. Improvement must be made to the State's microwave backbone current operated by the Oregon State Police, Department of Forestry and others. There has been no determination of the technology they may ultimately choose. Interoperability, Governance and Funding are their number one issues.

Utah

The current governance process in Utah has its roots in the Utah Communications Agency Network (UCAN), which was formed in May 1997. This multi-jurisdictional agency in the Salt Lake City area is charged with the operation and maintenance of a 10-county regional communications system serving 109 separate public safety governmental agencies. The system provides emergency communications for police, fire, EMS, transportation, corrections and other governmental agencies. This network supports 11,000 individual radio users. The system's critical test was the 2002 Winter Olympic Games in Salt Lake City, Utah.

The Utah Wireless Integrated Network (UWIN) Board was established by Executive Order in November 2003. The 24 members of the Board's executive committee were appointed by the Governor. Public Safety, Public Health, State Administration, UCAN and Local government were represented. (See Table 4)

An 800 MHz Digital P-25 communications system was installed prior to the 2002 Winter Olympics in the Salt Lake City area. The UWIN effort was directed to deal with the challenges to finance and implement the necessary infrastructure to ensure interoperability for both voice and data with the existing VHF infrastructure of the State in the Salt Lake City area. The UWIN effort was directed to deal with the challenges to finance and implement the necessary

infrastructure to ensure interoperability for both voice and data with the existing VHF infrastructure of the State.

A State Interoperability Executive Committee (SIEC) reporting to UWIN was recently formed to concentrate on the interoperability effort. Their task list includes:

- Involving all levels from State, Local, Federal and Tribal organizations.
- Developing an Outreach Committee.
- Obtaining high-level support from Political Bodies: State, County and City.
- Identify Grant Funding.
- Develop written plans, policies and procedures for the effort.
- Train and Educate users.

Ongoing informational meetings have been conducted throughout the State to allow out State personnel the opportunity to participate. Attendance has been reported to be discouraging.

Their statewide plan calls is an 800/VHF solution where 800 MHz is used in metropolitan areas and VHF is used in the rural areas. Currently there is an effort to document the existing the infrastructure in Greater Utah. Participation in the 800 MHz system is voluntary.

The 800 MHz system was funded with a Bond. User fees are charged by radio. Federal grants will be used to complete portions of the infrastructure and purchase radios. The current user fee is $22.50 for local government and $30 for the State user. They are working to equalize this figure.

Summary

Research by ***FE*** that (summarized in Table A3.1 on the following page) indicates that the governance body was most often created as a legislated entity. Some of the entities started out under an executive order, but were later codified.

STATE OR REGION	LEGISLATED	EXECUITIVE ORDER	MEMORANDUM OF UNDERSTANDING
CapWin			●
Colorado	●		
Illinois	●		
Indiana	●		
Michigan	●		
Minnesota	●		
Ohio	●		
Utah	●		
Oregon		●	
Washington			●

Table A3.1 – How Governance Groups Were Created

Table A3.2 depicts the variety of organizations that SIEC members represent. The number of members has been found to change during the process but only to effectively represent State, metropolitan and rural users.

	WA	ID	MI	MN	MT	NE	OR	UT
Police – Chiefs / Assoc	X	X	X	X	X		X	X
State Police/Patrol	X	X	X	X		X	X	
Sheriff – Chiefs / Assoc	X	X	X	X	X	X	X	X
Fire – Chiefs / Assoc	X	X	X	X	X	X	X	X
Emergency Medical			X	X		X		
Cities / Association	X	X	X	X	X	X	X	X
Counties / Association	X	X	X	X	X		X	X
Department of Transportation	X	X		X	X		X	X
Department of Natural Resources	X			X				X
Tribal					X		X	
National Guard / Military	X	X			X	X	X	X
DPS / PSAP / Emergency Mgt	X		X	X	X		X	X
Information Technology Services	X						X	X
Department of Agriculture								X
Criminal and Juvenile Justice			X		X			X
Department of Health				X	X		X	X
Department of Corrections							X	X
APCO / NENA							X	
Telecommunications / Utilities					X	X		X
Administrative Services		X		X	X		X	X
State Finance				X				
Federal Agencies		X			X			
Citizens					X			

1 Table A3.2 - Similarities and Differences in Membership
2

Also, Table A3.3 below represents considerations by other SIECs with respect to addressable issues during the planning process. Michigan is complete and Minnesota and Utah have constructed at least a portion of their statewide infrastructure.

		WA	ID	MI	MN	MT	NE	OR	UT
L-Legislation / EO-Executive Order		L	EO	L	L	EO	L	EO	EO
Number of Members		15	18	15	21	19	9	17	10
Mission Statement		Y	Y		Y		Y	Y	Y
Vision Statement		Y	Y					Y	Y
Technology & Standards Goal			P-25	P-25	P-25	P-25	P-25	P-25	P-25
Spectrum	**VHF**					X			X
	700/800 MHz		X	X	X		X		X
Funding	**Appropriation**		X	X		X	X		
Sources	**Federal Grants**		X	X	X	X	X	X	X
Considered	**Bond**								X
	911 Fees				X[2]				
	User Fees		X	X	X	X	X	X	X

Table A3.3 - Comparison of SIEC Efforts

Appendix 4 - Funding

Current Washington Funding Practices

1. The Governor of every state has designated a State Administrative Authority (SAA) to apply for and administer funds received from DHS.

2. The SAA is the only agency eligible to apply for DHS funds.

3. The Adjutant General (TAG) was designated by the Governor to be the SAA for Washington.

4. The Adjutant General (TAG) administers the grant process for monies received from the Department of Homeland Security (DHS) and Urban Area Security Initiative (UASI).

The DHS Office for Domestic Preparedness (ODP) provides financial assistance directly to each of the nation's States and territories through the ODP Homeland Security Grant Program (HSGP). This financial assistance is provided to enhance the capability of State and local agencies to prevent and respond to incidents of terrorism involving the use of chemical, biological, radiological, nuclear or explosive (CBRNE) weapons. Programs currently being administered by Washington include:

- SHSGP - The FY 2004 State Homeland Security Grant Program (SHSGP) is designed to enhance the capability of State and local agencies to prevent and respond to incidents of terrorism involving the use of chemical, biological, radiological, nuclear or explosive (CBRNE) weapons. Funding is for the purchase of specialized equipment, exercises, training, and planning costs associated with updating and implementing each State's Homeland Security Strategy (SHSS).

- LETPP - The Law Enforcement Terrorism Prevention Program (LETPP) is the result of a concerted effort to increase the level of funding available for prevention efforts, and the law enforcement community's desire to provide a conduit for terrorism intervention at the local level. The FY 2004 LETPP will provide law enforcement communities with funds for the following activities:

    1) Information sharing to preempt terrorist attacks.

    2) Target hardening to reduce vulnerability of selected high value targets.

3) Threat recognition to ascertain the potential or development of a threat.

4) Intervention activities to interdict terrorists before they can execute a threat.

5) Interoperable communications.

6) Management and administration.

Funding can be used for the activities above in the categories of planning, organization, equipment, training, and exercises.

- Urban Area Security Initiative Grant Program (UASI) - The FY 2004 UASI Program provides financial assistance to address the unique planning, equipment, training, and exercise needs of large urban areas, and to assist them in building an enhanced and sustainable capacity to prevent, respond to, and recover from threats or acts of terrorism. This program also provides funding to selected mass transit authorities for the protection of critical infrastructure and emergency preparedness activities. Allowable costs for both the urban areas and the mass transit authorities comprise the FY 2004 Homeland Security Grant Program, and funding is expended based on the Urban Area Homeland Security Strategies and transit system assessments. This funding will be provided to selected urban areas and mass transit authorities through the SAAs.

The FY 2004 (and projected FY 2005) UASI Program will significantly enhance the ability of urban areas to prevent, deter, respond to, and recover from threats and incidents of terrorism. Funding for mass transit systems is intended to address security needs at these high-risk critical infrastructure facilities and to promote comprehensive regional planning and coordination.

Urban areas must allocate all funding in support of goals and objectives identified in their Urban Area Homeland Security Strategy and in accordance with the State Homeland Security Strategy. Mass transit authorities must also allocate according to their Transit Security and Emergency Preparedness Plan developed through this program. [www.dhs.gov]

Funding Mechanisms

FE examined the current mechanisms for funding the improvements in interoperability between the public safety mobile radio systems in Washington. The primary approaches that are used include:

- State General Fund Budget.
- County and local/tribal Budgets.

- Federal Homeland Security Grants.

State Budget and Evaluation Processes

Washington enacts budgets for a two-year cycle, beginning on July 1 of each odd-numbered year. The budget approved for the 2003-05 Biennium remains in effect from July 1, 2003 through June 30, 2005. By law, the Governor must propose a biennial budget in December, the month before the Legislature convenes in regular session. The biennial budget enacted by the Legislature can be modified in any legislative session through changes to the original appropriations. Since the inception of annual legislative sessions in 1979, it has become common for the Legislature to enact annual revisions to the State's biennial budget. These revisions are referred to as supplemental budgets.[1]

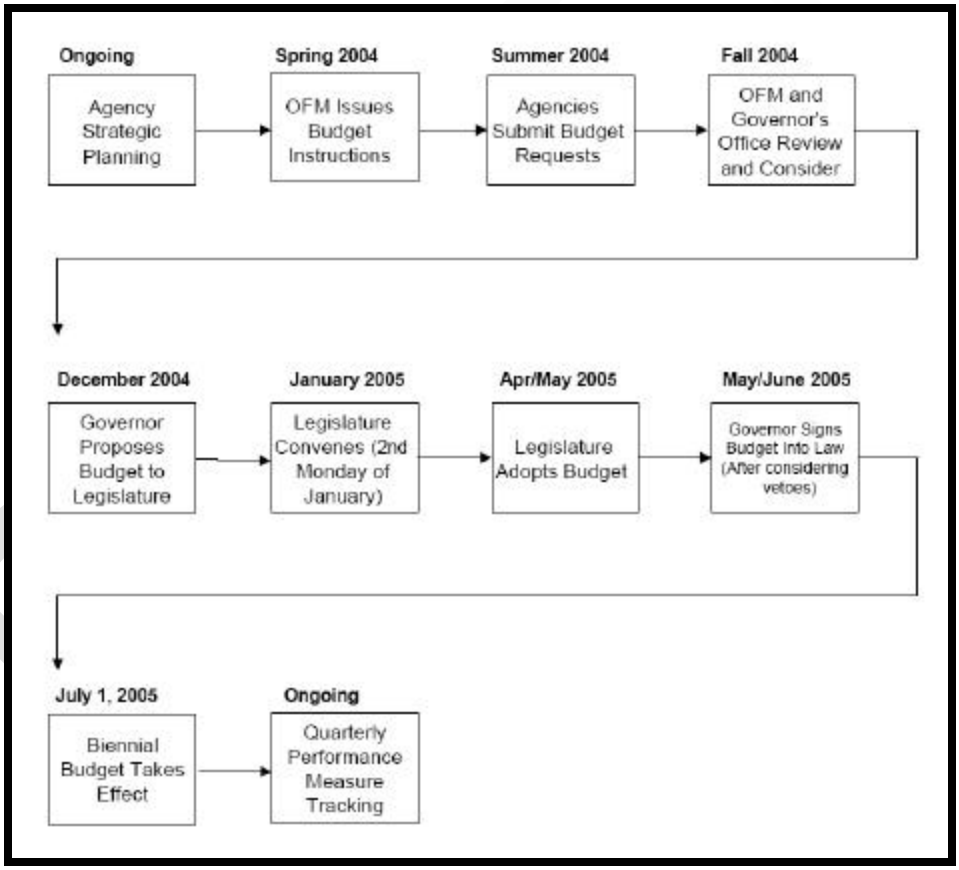


Figure A4.1 - Biennial Budget Process for 2005 - 2007

The magnitude of a project to improve the interoperability of public safety radio systems may well span multiple fiscal years and budget cycles. State agencies are responsible for developing budget estimates and submitting budget proposals to the Governor. Once the budget is enacted by the Legislature, agencies implement approved policies and programs within the budgetary limits imposed by legislation.

[1] Washington State Budget Process"; Budget Division, April 2004.

Homeland Security Grants from the Office for Domestic Preparedness are applied for through the Adjutant General and administered through the Emergency Management Department. In FY04, the State received $44,015,000 from the Homeland Security Grant Program and $17,213,850 from the Urban Area Security Initiative.

Federal Grant Sources

Major sources of additional federal grant funds to improve public safety radio communications were researched to find programs that should be evaluated for applicability in Washington.

Department of Homeland Security

(Sources listed from the DHS web site. See Attachment 2, 3 & 4 for details on DHS grants in 2004; http://www.ojp.usdoj.gov/odp/grants_programs.htm#fy2004itep)

In 2004 the U.S. Department of Homeland Security (DHS) Office of Domestic Preparedness (ODP) provided nearly $1.7B in grants for counter-terrorism to States. In mid October of this year the Homeland Security Appropriations Act was signed which provides $28.9B in net discretionary spending for the DHS. The Act includes funds for border and port security, State and local government, first responders and the National Incident Management System (NIMS). In 2004 the ODP had the following programs:

- FY 2004 Information Technology and Evaluation Program (ITEP)

The DHS Office of the Chief Information Officer (OCIO) was provided with funding to conduct information technology projects. The OCIO is specifically interested in working through State and local public safety agencies to fund novel uses of existing, "State-of-the-market" information technology that will remove barriers and improve information sharing and integration. The OCIO and ODP have agreed to collaboratively manage and administer the funds provided to the OCIO for information technology pilot projects.

- FY 2004 Competitive Training Grants Program

This program provides funding for training initiatives that further ODP's mission of preparing the nation prevent, deter, respond to and recover from incidents of terrorism involving weapons of mass destruction (WMD). This program invites applicants to submit training proposals that enhance State and local prevention, preparedness and response capabilities.

Entities eligible to receive funding under this program include: national associations representing public safety agencies and institutions of higher education, institutions of higher education, private corporations working in

conjunction with the nonprofit sector, and nonprofit organizations. ODP is committed to a competitive process for making the awards. The number of awards will be determined by the number, quality, and requested funding levels of the applications received, and the total amount of money budgeted by ODP for this solicitation.

- FY 2004 Assistance to Firefighters Grant Program

The purpose of the AFG program is to award grants directly to fire departments of a State to enhance their ability to protect the health and safety of the public, as well as that of firefighting personnel, with respect to fire and fire related hazards. Grants are awarded on a competitive basis to the applicants that first address the AFG program's priorities then demonstrate financial need and adequately demonstrate the benefit to be derived from their projects. Program areas for FY 2004 are:

- ✓ Operations and Firefighter Safety Program .
- ✓ Fire Prevention Program .
- ✓ Firefighting Vehicle Acquisition Program

For FY 2004, Congress appropriated $750 million to carry out the activities of the Assistance to Firefighters Grant Program.

- FY 2004 Homeland Security Grant Program.

This financial assistance is being provided to enhance the capability of State and local agencies to prevent and respond to incidents of terrorism involving the use of CBRNE weapons. In an effort to streamline funding, consolidation and administration of three programs, the State Homeland Security Program (SHSP), the Law Enforcement Terrorism Prevention Program (LETPP) and the Citizen Corps Program (CCP) have been integrated into one application to better facilitate the organization and coordination of preparedness funding and are guided by the State Homeland Security Assessments and Strategies.

- FY 2004 SHSP:

Provides funding for specialized equipment, exercises, training, and planning costs associated with updating and implementing each State's Homeland Security Strategy (SHSS).

- FY 2004 LETPP:

The LETPP provides law enforcement communities with funds for the following activities: 1) information sharing to preempt terrorist attacks; 2) target hardening to reduce vulnerability of selected high value targets; 3) threat recognition to recognize the potential or development of a threat; 4) intervention activities to interdict terrorists before they can execute a threat; 5) interoperable communications; and 6) management and administration. Funds can be used for these activities within the areas of planning, organization, equipment, training and exercises.

- FY 2004 CCP:

CCP provides funds to Citizen Corps Councils with planning, outreach and management of Citizen Corps programs and activities.

Funds are awarded to and distributed through the State Administrative Agency designated by the Governor of each State. Total funding provided through this award cycle is $2.2 billion.

- FY 2004 Urban Areas Security Initiative Grant Program

This program provides financial assistance to address the unique planning, equipment, training, and exercise needs of large urban areas, and to assist them in building an enhanced and sustainable capacity to prevent, respond to, and recover from threats or acts of terrorism. This program also provides funding to selected mass transit authorities for the protection of critical infrastructure and emergency preparedness activities. Allowable costs for both the urban areas and the mass transit authorities comport with the FY 2004 Homeland Security Grant Program, and funding is expended based on the Urban Area Homeland Security Strategies and transit system assessments.

Funds are awarded to and distributed through the State Administrative Agency designated by the Governor of each State. Total funding provided through this award cycle is $720 million in discretionary grants: $671 million to enhance the security of key urban areas and $49 million for the protection of critical mass transit systems with heavy rail and commuter rail components.

National Institute of Justice

(Sources listed from the NIJ web site. http://www.agileprogram.org/grants_funding/justnet.html")

- Bureau of Justice Assistance Local Law Enforcement Block Grants (LLEBG) Funds from the LLEBG program may be used for procuring equipment, technology, and other material directly related to basic law enforcement functions.

- Making Officer Redeployment Effective (COPS MORE) Grants. This grant program, provided through the Community Oriented Policing Services (COPS) office, is designed to expand the time available for community policing by current law enforcement officers through the funding of technology, equipment, and support personnel.

- Office for Domestic Preparedness Equipment Grant Program The goal of the ODP Equipment Grant Program is to provide funding to enhance the capacity of State and local jurisdictions to respond to, and mitigate the consequences of, incidents of domestic terrorism involving the use of a Weapon of Mass Destruction (WMD). Communications equipment is included on the authorized equipment purchase lists for these ODP grants.

- Office of Justice Programs (OJP) Information Technology Initiatives - The OJP Information Technology Initiatives web site offers access to timely and useful information on the information sharing process, initiatives and technological developments. The funding section of this site provides information on both federal and private funding sources, examples of innovative funding ideas, and tips on researching funding legislation.

- Technology Opportunities Program (TOP) The Technology Opportunities Program (TOP) from the National Telecommunications and Information Administration gives grants for model projects demonstrating innovative uses of network technology.

COPS

("Sources listed from the COPS website. http://www.cops.usdoj.gov")

The Office of Community Oriented Policing Services made the following awards in September 2004.

- $82.6 Million to Support First Responder Interoperable Communications Systems. The award went to 23 communities in 17 States to develop interoperable communication networks. The grants will cover the purchase of communication equipment, enhancements to communication infrastructures, data information sharing systems and project management

expenses associated with upgrading interoperable communication systems.

- $24 Million to Native American Law Enforcement Agencies. Awards were made under the COPS Tribal Resources Grant Program (TRGP). The awarded went to 114 tribal law enforcement agencies in 24 States. TRGP funds are awarded to enhance the law enforcement infrastructure and community policing practices in Native American communities, and fund such items as basic equipment, crime fighting technology systems and training.

Funding Approaches of Other States

A good source of ideas is other States that have attempted to build Statewide public safety radio systems. States were chosen for their recognition for their best practices by PSWN and a non-traditional funding scheme to provide a broad range of ideas for Washington to consider when funding its Statewide public safety mobile radio system interoperability project.

In researching what other States are doing, certain patterns became apparent. ***FE*** confirmed the anticipated obvious conclusion, that the two primary sources for funding in most States are the general fund budgets and Federal grants. Some States are using a fee-based approach for funding their statewide public safety mobile radio systems, where the local and county participants pay for the use of the statewide system, as well as potentially for their subscriber equipment.

In some cases, these charges are used for recovery of the initial investment and for on-going maintenance. To a lesser extent, fees or surcharges, trust funds, bonds, and taxes are used as sources of funds. Table A4.1 on the following page summarizes the funding mechanisms utilized by selected States to support PSMR projects.

STATE	GENERAL FUND	BONDS	TRUST FUND	TAX	GRANTS	FEES	USER CHARGES
ALASKA	●		●		●	●	
COLORADO	●		●		●		●
FLORIDA	●				●	●	
INDIANA	●		●		●	●	●
MICHIGAN	●				●		●
MINNESOTA	●				●	●	●
MONTANA	●				●	●	●
N. DAKOTA	●				●	●	
NEBRASKA	●	●		●	●		
OHIO	●				●		●
S. DAKOTA	●				●		
UTAH	●	●	●		●		●
WYOMING	●				●		●

Table A4.1 – Funding Mechanisms

Further detail that will provide added insights on the chosen States follows:

Alaska considered numerous mechanisms to fund their public safety communications system. Besides State appropriations:

- A partnership with the Federal Department of Defense was established.
- Federal grants were sought.
- Joint grant applications were developed for tribal grant funds.
- Rural area trust funds were used, and a
- Public-private partnership was established with the Alyeska Pipeline.

Colorado established a Public Safety Trust Fund in 1998, which was seeded with $50,000,000 from the General Fund. Recently Colorado has taken advantage of Federal Grants. State agencies and local jurisdictions are required to repay any loans that are received from the trust fund. The Trust Fund receives monies from grants, repayments of loans, and annual end-user access charges.

Florida entered an innovative partnership with the vendor of its Statewide Law Enforcement Radio System. Florida made one advance payment of $40,000,000. Additionally, the vendor receives the proceeds from a motor vehicle and vessel registration surcharge fee. Under a formula, the State receives revenue from

tenants on the towers, additional service sold to other parties, and proceeds from the sale of its old system.

Georgia has been trying for more than fifteen years to build a statewide radio system. Funding has never been approved for the project. The Georgia Technology Authority sees itself in a support role not a leadership role. The latest attempt is trying to partner with the seventeen counties that make up Atlanta's metropolitan region. The funding focus is on obtaining enough federal grant money to build a regional public safety radio system.

Indiana funds its Integrated Public Safety Communications System through State appropriations, bonds, federal grants, and via 9-1-1 user fees. Agencies do not pay user fees, but are required to purchase and maintain user and dispatch equipment. A tax of $1.25 is assessed on every driver's license, motor vehicle registration and boat registration transaction. This tax yields approximately eleven million dollars annually that is used for the radio project. The State is actively pursuing federal grant monies, and hopes to realize thirty million dollars for the radio system.

Michigan built its public safety communications system through State appropriations and federal grant monies. Members or users of the system pay a one-time activation fee $25 per radio and a subscriber fee of $200 for each radio per year.

Minnesota plans to increase the 9-1-1 fees by 27 cents per wire line and wireless line within the State. Federal grant monies will be sought, and revenue from tower leases is expected to help defray some costs. Expansion of the system to accommodate local users will be paid for by the local jurisdiction. Minnesota uses its 9-1-1 surcharge to help fund its public safety mobile radio system project, in addition to capital bonds. There is no clear enunciation of a funding initiative, which has led to some duplication of effort at the State and regional level. The State did receive $16 Million in Homeland Security Grant funding last year. Recently the 9-1-1 monies had to be utilized to pay for wireless location identification. Due to this, the 9-1-1 funding is running a deficit, so this funding has become very speculative.

Montana is considering the use of State appropriations, special revenue accounts, and user fees to build the regionally oriented, interoperable, public safety radio systems. Montana will also rely on federal appropriations and federal grants for funds.

Nebraska remains in the planning track for its public safety radio system. State appropriations and federal grants will provide much of the funding. Nebraska has passed unique legislation to help local communities fund the acquisition of radio equipment. Each jurisdiction is authorized to levy a yearly tax of not more than .05 cents per $100 of the taxable value of all taxable property within its

boundaries. Any jurisdiction that has levied or intends to levy a tax may issue tax anticipation bonds.

North Dakota is in the planning track for its public safety radio system and expects that Homeland Security grants will be a significant source of financing for the project. Besides general funds some State funding alternatives are being considered. Those alternatives include:

- State Lottery
- State Tax Revenues
- State user fees
- Surcharges and
- State Bonds

Ohio built MARCS, the Multi-agency Radio Communication System, with State funding and some federal grant money. Today, each user pays an annual fee of approximately $19 for mobile voice and $341 for mobile data.

South Dakota has implemented its trunked radio system as of October 2002. State appropriations and some federal funds were the primary financing sources.

Utah built the Utah Communications Agency Network (UCAN) for the 2002 Olympics. State, Federal and local funds were used to build the system. UCAN is authorized to issue bonds that are guaranteed by revenues from user fees. Utah uses a cost recovery system based on annual access fees per radio, which makes users focus on the real cost of radio communications.

Wyoming has completed and submitted a business case to the Legislature for funding. At this time $9,000,000, through a combination of State and Federal dollars, is expected to be available in July 2004 for concept demonstration projects.

Appendix 5 - Current and Emerging Technologies

Any radio interoperability plan must consider both the current level of operations and capabilities, and also take a look at what new technologies are likely to affect system operations. It is very important for the State of Washington to closely consider future trends, technologies, and communications expectations as it makes current decisions regarding hardware, networks, infrastructure, and backbone capabilities.

This appendix contains a detailed analysis of radio communications technologies today, and those that can be anticipated over the next few years. We know that narrowbanding is coming, 700 MHz frequencies and equipment will be made available, and Voice Over Internet Protocol (VoIP) technology is already taking form. As State, regional, local, and tribal leaders make decisions regarding the direction of agencies (both independently and collectively as an integrated, statewide emergency response team), future capabilities need to be folded into procurement and sharing initiatives. Backbone network, voice radio, and mobile data decisions will be required and planning actions must be instituted for all three.

More than technology is involved in a statewide plan for radio communications interoperability. The regulatory landscape, as well as the activities of Standards Development Organizations (SDOs), must be factored into the decision-making process. Longer-term Federal Communications Commission (FCC) initiatives and mandates to develop more channels for public safety use will impact every agency in Washington. The radio system migration from analog to digital modulation, while just emerging in Washington today, will be dominant by the year 2008. SDOs will play a key role in determining which protocols and features can be standardized in the marketplace.

An analysis of FCC initiatives is contained in Appendix 6. The FCC has defined standards for interoperability in the new 700 MHz public safety spectrum. These standards have been endorsed by both APCO (Association of Public Safety Communications Operators) and NCC (National Coordination Committee) and are well defined in FCC WT Docket No. 96-86 of January 17, 2001. This docket describes a plan for meeting Federal, State, and local public safety communications requirements through 2010.

SAFECOM has outlined six methods to achieve radio system interoperability:

1-swap radios

2-talk-around

3-mututal aid channels

4-gateway/console patch

5-system specific roaming

6-standards based shared system

Although these methods are not new to radio communicators, they form a procedural landscape that continues to frame how agencies can talk together. These options are germane to Washington's current and future interoperability decisions as well. A more detailed definition is contained in Appendix 5.

In 2002, SAFECOM was formed from the Public Safety Wireless Network (PSWN) program, and was established to oversee all communication and interoperability initiatives and projects. To the extent that SAFECOM, managed by the Department of Homeland Security, Science and Technology Directorate (DHS, S&T), addresses radio communications issues in a standardized and coordinated way, this body could have significant influence over how States and local agencies procure and implement communications systems. Washington stakeholders will need to consider SAFECOM's initiatives and goals to achieve consistent policies and procedures for interoperability.

APCO Project 25 (P25), although not a federally mandated standard, has widespread acceptance over the population of public safety associations, agencies, and governing bodies. Whatever your views on "P25 versus non-P25", the fact remains that there are opportunities to leverage the advances of radio technology for voice and data transmission throughout the user community. Statewide goals and objectives that do not take P25 issues into consideration may miss the capabilities available with other emerging voice and data technologies.

Also, this appendix provides a detailed analysis of Land Mobile Radio systems, capabilities, and vendors. While this information is not new to those who routinely work with these systems, it is background information that should be considered by statewide decision-makers as well. Additionally, some agencies believe that the cellular solution is a viable backup solution, or that gateway patching options are the best options for the money. These and other capabilities are discussed in detail in the appendix.

Finally, what will be the impact of PDA (Personal Data Assistant), Wi-Fi (wireless LAN), 4.9 GHz, software defined radios (SDRs), and satellite technology over the next 5-10 years? These and other considerations are outlined here and can be discussed further in the planning stage.

No current or future solution that enables effective communications between first responders is necessarily the wrong one. The right solution for Washington will be derived from a combination of political, preference, resource, history, cost of ownership, and mission requirements unique to this State. Going forward necessitates occasional glances in the rearview mirror, but prolonged analysis of the road ahead is the key to success.

Complex system implementations should be viewed from the "system after next" perspective. That is, consider procuring and implementing open architecture systems based on our best understanding of available technologies 3-5 years out, such that investment in those systems benefits the majority of stakeholders through the evolution of technology 8-10 years out. Budgets will not sustain a system upgrade schedule that mirrors the introduction of new technology. Ensure someone is looking at the trends and anticipating the road ahead, so that implementation plans will bring Washington not just up to current technologies, but position the State for emerging capabilities in the years ahead.

The following section contains a brief technical overview of radio communications systems currently available.

Communications System Interoperability Concepts

The Federal Communications Commission has defined "interoperability" as "an essential communications link within public safety and public service wireless communications systems which permits units from two or more different entities to interact with one another and to exchange information according to a prescribed method in order to achieve predictable results."

State, county and city agencies in the State of Washington, as well as other public safety entities nationwide, are being challenged with radio system interoperability issues. Over the years separate government entities have deployed radio systems on different bands and technology protocols. During this time, the tendency of government management has been to segment their system coverage to convenient geographic and organizational boundaries. A survey, of more than 1,500 local and regional public safety agencies (conducted by SAFECOM) found that nearly one-third of these agencies have had difficulty responding to incidents because of a lack of wireless communications interoperability. Similar results were found in interviews conducted by ***FE*** with other clients, in for instance, the State of Wisconsin.

Interoperability is very important to the FCC and it has defined standards for interoperability in the new 700 MHz public safety spectrum. The decisions the FCC has made, endorsed by both APCO and NCC (National Coordination Committee), are well defined in their Fourth Report and Order, WT Docket No. 96-86, released January 17, 2001. This docket describes a plan for the development of operational, technical and spectrum requirements for meeting

Federal, State and Local public safety communication requirements through the year 2010.

Much planning has gone into defining proper management and control of the new 700 MHz public safety spectrum. As there are additional considerations due to the "Line A" issues for the State of Washington, the planning for this spectrum is taking place within the Regional Planning Commissions (RPCs). In Washington this committee is designated Region 43. The committee has been quite proactive in developing a plan for utilization of this spectrum within the State.

Interoperability has been recognized as a key factor in determining the success of any coordinated response. It has been the focus of improvement efforts by, local, State, and federal users since 1989. Meeting the interoperability challenge means not only identifying the appropriate communication technology, but also creating communication channels among organizations to allow for preplanning and coordination activities. PSWN, the Public Safety Wireless Network program, which was a joint initiative of the U.S. Department of Justice and Treasury, identified three types of interoperability (the Washington SIEC Interim Statewide Public Safety Communications Systems Plan, published on March 30, 2004, also incorporated these definitions):

- *Day-to-day interoperability* covers routine public safety operations, such as responding to a building fire that requires backup for a neighboring fire department, or a vehicle chase that crosses between villages.

- *Mutual aid interoperability* supports a joint and immediate response to catastrophic accidents, large-scale incidents and natural disasters. It supports tactical communications in response to airplane crashes, bombings, forest fires, earthquakes, hurricanes and similar events that occur without warning.

- *Task force interoperability* supports local, State and federal agencies collaborating for an extended period of time to address a particular problem. For example, a task force might lead extended recovery operations, provide security for major events, or respond to prolonged criminal activity. These are activities that are planned in advance.

The 9/11 terrorist events in New York City and at the Pentagon, again emphasized the need to public safety agencies that solutions must be found to address this problem. In these incidents, the local public safety community played a prominent role in the immediate response and throughout the recovery period. The less time responders need to spend solving the "how do I talk to the person next to me" problem during a major incident, the more they can focus on the dangerous, time critical tasks at hand.

The Public Safety Wireless Advisory Committee (PSWAC), in their very thorough final report issued September 11, 1996, found six methods or techniques that can be utilized to achieve radio system interoperability. The technical and operational solutions to improve communications interoperability generally fall into one of these categories, as follows. Many of these solutions have been in use for years, and generally work well for most scenarios. The question is, to what degree does the State or the municipalities want to be ready for the catastrophic event – man-made, terrorist, or natural disaster – and be able to handle the stress that it will put on the current systems and methodologies.

Swap Radios

The simplest and most basic level of interoperability is to physically exchange radios with other agencies involved in an event. This method works well for small-scale incidents. However, it is impractical for every agency to have extra radios and charged batteries on hand for each member of every other possible agency that could appear on-scene, especially for large-scale events.

Talk-around

Talk-around provides interoperability where multiple radio users talk radio-to-radio during a localized incident on the same transmit and receive frequency, in the conventional mode. In this situation, communications are tightly bound by the air interface: the same frequency band is required and transmissions are digital-to-digital or analog-to-analog, not analog-to-digital.

Mutual Aid Channels

With mutual aid channels, responding radios talk via designated simplex frequencies similar to talk-around or dedicated repeaters, which extend their communications range and allow connection to a console dispatcher. This method requires agencies to create a channel plan and to program channels into their radios in advance of an event.

Gateway/console patch

Use of an RF/network gateway or console patch in a dispatch center are methods of connecting disparate systems of different frequency bands. One major drawback for using a gateway or console patch during an unplanned event is that there must be overlapping coverage from the respondent's systems for the gateway to be effective. To get around the requirement for overlapping coverage areas, some gateways are set-up to be transportable. This allows responders from different system types to talk to each other but does have a necessary delay to allow a technician at the scene to set up the relay.

System-specific roaming

The response of city and county responders at the Pentagon on September 11, 2001 provided an example of the system-specific roaming method of interoperability. One entity's radios are programmed to work on the other's infrastructure within a set of pre-planned channels or talkgroups. The multiple infrastructure networks provide coverage over large areas without any coverage overlap. Since users can roam from one system to the next they may enlist the help of agencies across the entire area at a moment's notice. This method requires pre-planning and system configurations to accommodate the users of the participating systems.

Standards-based shared system

The ultimate interoperability solution, which is useful for any scale of event from small to massive, is a standards-based, shared system. In this method all radios built to a standard can talk to each other via the infrastructure, or in the case of the Project 25 equipment, conventional mutual aid and talk-around also.

The federal Department of Homeland Security (DHS) has been acutely aware of the need for radio system interoperability improvements since it's creation last year. Secretary Tom Ridge, speaking to the National Fire and Emergency Services Dinner, April 30, 2003, said the following about interoperability:

> *"Helping first responders stay safe and effective and alive is our department's goal. Whether by analyzing the vulnerabilities of our critical infrastructure, enhancing hospitals capacity to treat victims of bioterrorism, informing communities through our threat advisory system, or encouraging the next generation of homeland security products and technology. One of those is Project SAFECOM. This is our effort to ensure wireless interoperability so firefighters and other emergency responders can communicate with one another in any crisis.*
>
> *It is imperative that we provide ways for you to communicate across jurisdiction lines. It doesn't necessarily mean that everybody will be able to talk to everybody else at the same time, we don't want that at a time of crisis, but those that need to be connected, particularly back to the command post and to critical centers around the event, need to be part of a system that is progressive and redundant and better than we've ever designed before. With the right structure and strategy in place I think we can focus on providing the right resources."*

Secretary Ridge and the DHS are emphasizing the need to resolve these interoperability issues with standards-based products. According to a report done by the National Task Force on Interoperability (February 2003), the public

safety community has identified the following key issues that hamper public safety wireless communications today:

- Incompatible and aging communications equipment.
- Limited and fragmented budget cycles and funding.
- Limited and fragmented planning and coordination.
- Limited and fragmented radio spectrum.
- Limited equipment standards.

In short, the Nation is heavily invested in an existing infrastructure that is largely incompatible. The SAFECOM Program, which replaced the PSWN Program in 2002, was established by the Office of Management & Budget and approved by the President's Management Council to address these public safety communications issues.

The SAFECOM Program[3]

In fiscal year 2002, as part of the President's Management Agenda, the White House established SAFECOM as the overarching umbrella program within the Federal Government to oversee all communication and interoperability initiatives and projects. The SAFECOM Program, based on the Public Safety Wireless Network committee (PSWN), is managed within the Department of Homeland Security's Science and Technology Directorate. Through SAFECOM, the Federal Government is attempting to address public safety communications issues in a more coordinated, comprehensive and, therefore, effective way.

The mission of SAFECOM is to serve as the umbrella program within the Federal Government to help local, tribal, State, and federal public safety agencies improve public safety response through more effective and efficient interoperable wireless communications. Communications interoperability from the SAFECOM perspective is “the ability of public safety agencies to talk across disciplines and jurisdictions via radio communications systems, exchanging voice and/or data with one another on demand, in real time, when authorized”.

SAFECOM is the first national program designed by public safety for public safety. As a public safety practitioner driven program, SAFECOM is working with existing federal communications initiatives and key public safety stakeholders to address the need to develop better technologies and processes for the cross-jurisdictional and cross-disciplinary coordination of existing systems and future networks. SAFECOM harnesses diverse federal resources in service of the public safety community. The scope of this community is broad. The customer base includes over 44,000 local and State public safety agencies and organizations. Federal customers include over 100 agencies engaged in public safety disciplines such as law enforcement, firefighting, public health and disaster

[3] *Information extracted from SAFECOM’s web site www.safecomprogram.gov*

recovery. And SAFECOM makes it possible for the public safety community to leverage resources by promoting coordination and cooperation across all levels of government.

SAFECOM's Near-Term Initiatives:

- Develop a process to advance standards necessary to improve public safety communications and interoperability.
- Integrate coordinated grant guidance across all agencies providing grants for public safety communications and interoperability.
- Provide training and technical assistance for public safety communications and interoperability.
- Create a one-stop shop for public safety communications and interoperability.
- Research, develop, test, and evaluate existing and emerging technologies for improved public safety communications and interoperability.

SAFECOM's Long-Term Goals:

- Provide policy recommendations.
- Develop a technical foundation for public safety communications and interoperability.
- Coordinate funding assistance for public safety communications and interoperability.
- Create and implement a national training and technical assistance program.

SAFECOM, with its partners, is attempting to support a safer America through effective public safety communications. On April 26, 2004 The U.S. Department of Homeland Security's Science and Technology Directorate announced the release of the first comprehensive Statement of Requirements (SoR) document outlining future technology requirements for public safety wireless communications and interoperability. The SoR can be found at www.SAFECOMprogram.gov.

The SoR, developed under the SAFECOM Program, marks the first time the 44,000 public safety agencies have a document that defines future requirements for communicating and sharing information -- as authorized, when and where

needed, and in a manner that allows for the most effective use of that information.

Federal Government Spectrum Available

The National Telecommunications and Information Administration (NTIA) has specified forty (40) Federal Government frequencies that can be used by non-Federal government public safety entities for communications involving coordination and cooperation with Federal Government agencies. These frequencies may not be used to meet the day-to-day communications needs of non-Federal government, public safety entities. Due to previous frequency authorizations to Federal Government agencies, not all channels are available at all locations. The rules governing the use of these frequencies are set forth in Section 4.3.16 of the NTIA Manual of Regulations and Procedures for Federal Radio Frequency Management. (See the NTIA web page at: www.ntia.doc.gov/osmhome/redbook.html.)

This does give another complete set of interoperability VHF frequencies for use by the public safety sector during emergency situations.

APCO Project 25 Digital Radio Systems

"Project 25" was a very significant undertaking of the Association of Public Safety Communications Officials (APCO) International, Inc. It was born as a joint effort between APCO and the National Association of State Telecommunications Directors (NASTD), and has now evolved to an industry wide effort coordination by the Telecommunications Industry Association (TIA).

It is an initiative to define standards for interoperability between two-way/land mobile radio systems, primarily for local, State and federal government but there are impacts and advantages for commercial users as well. This is very important in order to avoid the mistakes of the past as radio systems migrate from analog to digital modulation. The goal is to leverage the advances in radio technology, e.g. synthesized versus 'specific channel' transceivers, trunking technologies, and digital modulation for voice and data. Equipment that is compliant with the standards includes additional capability in radio communications (more conversations over the same number of channels, digital modulation with encryption capability for secure voice communications, data communications, radio units belonging to one entity being able to operate on channels of other entities) as the new equipment is deployed but the usefulness of existing, installed equipment is also maintained (so as not to force obsolescence of existing equipment in advance of normal replacement cycles).

The Project 25 (P25) Standard utilizes frequency division multiple access (FDMA) to achieve four main objects, as follows.

1. Improved spectral efficiency using narrow band channels.

2. Interoperability between different agencies and levels of government.

3. Graceful forward and backward system migration.

4. Scalable Trunked and Conventional Capabilities.

Presently, 30+ individual standards documents have been published that define various aspects of the requirements for radio equipment to be able to 'interoperate' according to the "Project 25" Standard. This current set of documents, identified as Project 25 Track 1, have been developed in an orderly, open Standards Development Process, under the auspices of TIA. The process was designed to be fair and to encourage wide participation in order to achieve the greatest 'bang for the buck' from the technologies and to exclude technologies dominated or 'owned' by any entity unless the owner agreed to share the technology with competitors. The 'technical areas' of these standards are: Common Air Interfaces (CAI), data interfaces, intersystem interfaces, Trunking services, network and network management interfaces, public-switched telephone network interfaces, host data interfaces, and encryption and key management (including Over the Air Re-keying). The data interface definitions consist of four different documents.

Project 25 has achieved support from both the Public and Private Sectors…the Public Sector being predominantly 'users' of the radio equipment and systems and the Private Sector representing 'users' as well as manufacturers. As mentioned earlier, the FCC has chosen this suite of standards for the new 700 MHz frequency band.

The next generation digital standard called Project 25 Track II is in process under the direction of the TIA committees. This standard, with it's new suite of documents, is targeted to address the 6.25 KHz channel mandate from the FCC. It will also be backward compatible with the current 12.5 KHz suite of standards.

Many sources of information are available on the World Wide Web and some of these have been used as research for this study. Most notable among these is a web document titled "APCO Project 25 STANDARDS FOR PUBLIC SAFETY DIGITAL RADIO" (http://www.apco911.org/frequency/project25/information.html).

SAFECOM has provided the following Statement regarding their approach to Project 25 Standards as it relates to grant opportunities:

"When procuring equipment for communication system development and expansion, a standards-based approach should be used to begin migration to multi-jurisdictional and multi-disciplinary interoperability. Specifically, all new systems should be compatible with the ANSI/TIA/EIAA-102 Track 1 (Project 25 or P25) suite of standards. This recommendation is intended for government owned or leased land mobile public safety radio equipment and its purpose is to make sure that such equipment or systems are capable of interoperating with other public safety land mobile equipment or systems. It is not intended to apply to commercial services that offer other types of interoperability solutions and does not exclude any application if it demonstrates that the system or equipment being proposed will lead to enhanced interoperability. With input from the user community, these standards have been developed to allow for backward compatibility with existing digital and analog systems and to provide for interoperability in future systems. The FCC has chosen the P25 suite of standards for voice and low-moderate speed data interoperability in the new nationwide 700 MHz frequency band and the Integrated Wireless Network (IWN) of the U.S. Justice and Treasury Departments has chosen the Project 25 suite of standards for their new radio equipment. P25 has also been endorsed by the US Department of Defense for new LMR (Land Mobile Radio) radio systems.

However, the first priority of federal funding for improving public safety communications is to provide basic, operable communications within a department with safety as the overriding consideration. Funding requests by agencies to replace or add radio equipment to an existing non- P25 system will be considered if there is an explanation as to how their radio selection will allow for improving interoperability or eventual migration to interoperable systems. This guidance does not preclude funding of non-Project 25 equipment when there are compelling reasons for using other solutions. Absent these compelling reasons, SAFECOM intends that Project 25 equipment will be preferred for digital systems to which the standard applies."

The following organizations have endorsed Project 25 standards (as reported on the APCO web site):

- American Association of Railroads (AAR)
- APCO Canada
- APCO International
- British APCO (BAPCO)
- British Home Office

- Defence Research Agency (UK)
- State of California Division of Telecommunications
- State of Colorado Communications
- State of Delaware
- Federal Bureau of Investigation (U.S.)
- Federal Communications Commission (U.S.)
- State of Florida Division of Telecommunications
- State of Georgia Division of Communications
- Houston (Texas) Police Department
- Illinois State Toll Highway Authority
- Indiana State Police
- International Association of Chiefs of Police (IACP)
- State of Kentucky Telecommunications
- Lower Merion (Ardmore, Pennsylvania) Township Police
- City of Minneapolis
- State of Minnesota Department of Transportation
- State of Montana
- City of Montreal
- National Association of State Telecommunications Directors (NASTD)
- National Communications System (U.S.)
- National Institute of Justice
- National Security Agency (U.S.)
- National Telecommunications and Information Administration (NTIA)
- State of Nebraska
- State of Nevada Department of Public Safety
- New York State Police
- New Jersey State Police Communications
- State of Oklahoma
- Orange County (California) Division of Communications
- Peel Regional Police Systems (Canada)
- San Bernardino County (California)
- Suffolk County (New York) Police Department
- State of Utah
- Commonwealth of Virginia EMS
- Commonwealth of Virginia State Police
- State of Washington Division of Telecommunications
- State of Wyoming Division of Telecommunications
- Telecommunications Industry Association (TIA)
- University of California - Berkeley
- U.S. Air Force - Hanscom Air Force Base
- U.S. Army - Fort Monmouth
- U.S. Coast Guard
- U.S. Department of Defense
- U.S. Defense Information Systems Agency
- U.S. Department of Energy
- U.S. Department of Treasury

- U.S. Drug Enforcement Administration
- U.S. Fish and Wildlife Service
- U.S. Forest Service
- U.S. Immigration and Naturalization Service
- U.S. Marshall Service
- U.S. Park Police
- U.S. Secret Service

Public Safety Radio System Solutions

We know from the summary above that public safety agencies in the State of Washington utilize both conventional and trunked radio systems in the VHF, UHF, and 800 MHz radio bands. The infrastructure and subscriber equipment making up these systems was purchased predominantly from two vendors, E.F. Johnson, Inc., and Motorola, Inc., while the subscriber radios come from numerous vendors. In this section we will initially discuss in some detail the infrastructure architectures, which make up the building blocks for the various radio systems of public safety agencies in the State. Following this are sub-sections analyzing base station, mobile, and portable equipment available in the public safety market place today with a focus on interoperability features.

Radio Systems Infrastructure Architecture

Before discussing interoperability issues with various systems and vendors, a common radio systems design reference needs to be established. Typically, Land Mobile Radio (LMR) systems are engineered using one of two radio site architectures: conventional, trunked, or a combination of the two.

A conventional LMR system, in its simplest design, consists of a single base station at a tower site on a single frequency. In this case the base station would be “simplex” because it can’t transmit and receive simultaneously. The mobile or portable user would be able to communicate with a dispatcher but not with other users. If another frequency is authorized for use (licensed) then the base station can operate in what is termed the “duplex” or “repeater” mode, which will repeat the subscriber audio received on frequency F1 simultaneously to a dispatcher and other subscribers that are listening on frequency F2. A typical system diagram can be found in Figure A5.1 below.

The range or coverage area over which the users can communicate with this “single site” conventional system is set by a number of radio engineering design parameters. These design choices include for instance; transmitter power output, height of the tower, frequency band used, mobile radio installation, and portable radio configuration.

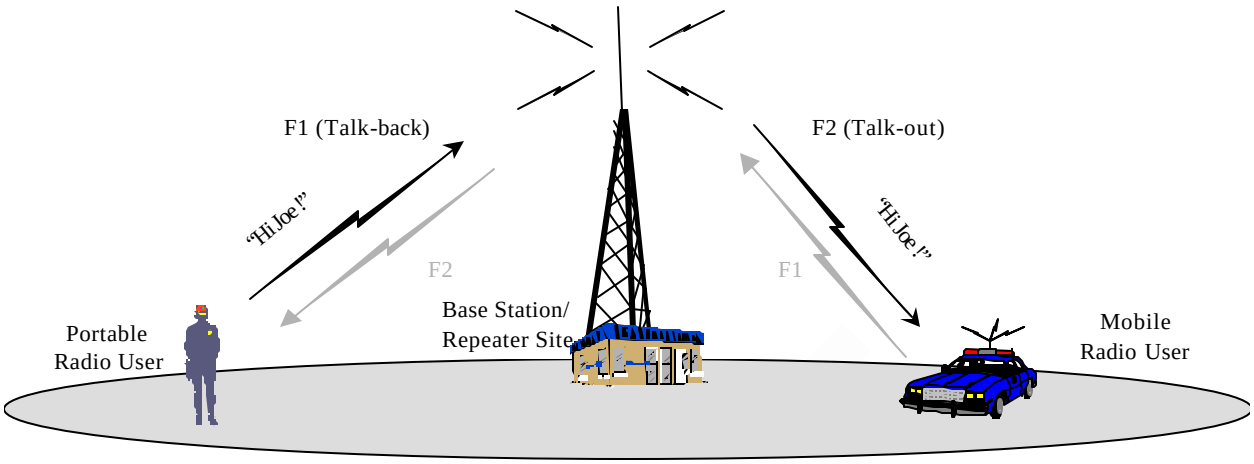


Figure A5.1 – A Single Site Conventional System (Source PSWN).

Depending on the frequency band in use, the base transmitter in a LMR system typically has much more power than mobiles or portable radios. Also, the base antenna is typically at a much higher elevation than mobile or portable radio antennas. For these reasons, dispatcher or repeated two-way communications with mobiles and portables is limited by their talkback capability.

Receiver Voting Sub-systems

In general the mobile user in Figure 6.1 will have a much greater talk-back range than the portable radio user. This results from the higher power output and better antenna efficiencies of the mobile radio installation. A way to improve the talk-back coverage for the portable radio is to add more base station receiver sites on the talk-back frequency at the proper locations throughout the desired coverage area. The recovered audio from these additional "receive-only" sites is brought back to the transmitter location on dedicated links and processed by the signal "comparator" of a "receiver voting" sub-system. The comparator will select (vote) the best signal from among all of the receivers and send that audio to the dispatcher and other system users. The required quantity of these receive-only sites is determined by the system performance desired and is highest if portable in-building coverage is specified.

For countywide or regional coverage the service area may require multiple transmitter sites for simultaneous coverage of that area. The two major types of such systems are simulcast and multicast transmit.

Simulcast Transmit Systems

Simulcast conventional or trunked systems use several geographically separated base stations/repeaters that transmit on the same frequencies simultaneously. Through this type of a system deployment, a single radio channel can be radiated over a wider region than with a single-site transmitter. These networks

require a timing system to synchronize each transmitter on the network to assure that transmissions on the same frequency are in track thus reducing heterodyne interference. A simulcast system, when keyed, performs a quasi-synchronous transmission, which means that the same message is transmitted at the same time on the same radio channel by two or more transmitters that are track-locked to the same frequency.

Simulcast transmit systems are used where:

- A large service area must be covered by transmitters of moderate power, in which case there will be a small overlap in the coverage of the transmitters.

- Intensive (high signal-to-noise ratio) coverage is needed throughout the area, for instance if building penetration is required, in which case there will be a substantial overlap in the coverage of the transmitters that are used to provide diversity against shadowing.

- Available spectrum is insufficient to implement a multicast or zone-type system.

Multicast & Zone Systems

Multicast conventional or trunked systems are similar to simulcast systems with exception of the radio channels transmitted (see Figure A5.2 below). While a simulcast system transmits on the same RF channels simultaneously from each base station/repeater, multicast systems use different RF channels at each site. Frequencies can be reused in different cells, but the arrangement ensures the same frequency is never used in adjacent cells. This configuration offers the same coverage advantages of a simulcast system, eliminates the occurrence of co-channel interference from multiple sites, and allows smaller cell configuration which can allow greater RF penetration within the cell. However, multicast systems require multiple frequencies (limited available spectrum) and, for conventional systems, their users need to change mobile channels as they move between cells.

Zone systems are similar to multicast except that receive only sites are distributed in the zones by frequency where they are most needed. The system designer is required to know the service area of individual agencies in the county or State and will adjust the transmit and receive sites accordingly.

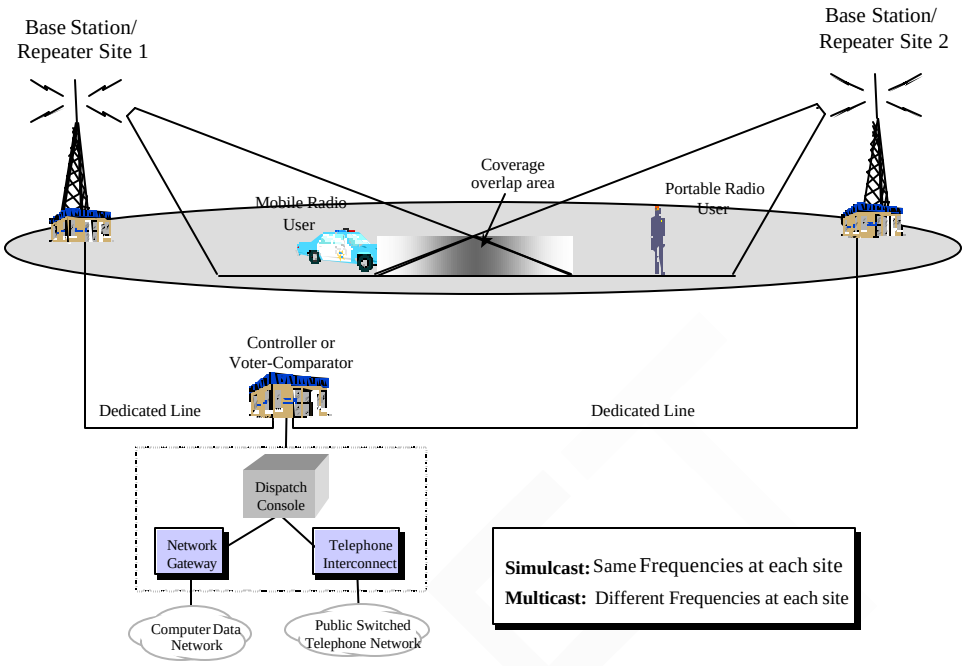


Figure A5.2 – Typical Two-Site Transmitter System (Source SAFECOM)

Trunking Systems

Since radio frequency spectrum is a limited resource and can be costly to obtain, radio equipment manufacturers developed trunking systems to optimize the use of available licensed channels. In general terms, trunking is the commonly accepted term for computer controlled sharing of a relatively small number of communications channels among a relatively large number of users. In contrast to a conventional LMR system in which users communicate over a dedicated channel, a trunked system uses a computer-driven controller to dynamically assign a channel to a user or group of users on a call-by-call or transmission-by-transmission basis.

When a user presses the push-to-talk button, the request-to-talk is sent out on the system control channel to the system controller, which checks the ID of the talkgroup with which the radio user wants to communicate, checks for a vacant channel, and sends channel assignment instructions on the control channel to all of the radio units presently selected (turned on) for that talk group. After a channel is assigned, the identified users have private use of that channel for the duration of the transmission (transmission trunking). If no channels are free, the request is sent to a queue where it remains until a channel is available. The controller can assign preference to the members of this group to complete their conversation through the use of a "message trunking" feature or software algorithm. Once the conversation is complete, the channel is returned to the pool of channels where it is available to other users. Transmission trunking is slightly more efficient in the use of frequencies than is message trunking. However, it is recommended that emergency calls utilize message trunking to avoid the possibility of receiving a busy during the call.

The trunking process takes advantage of the fact that not all channels (or talk groups) are used simultaneously, thus employing available bandwidth more efficiently than conventional system technology. Typical channel use statistics are very supportive of this conclusion. For example, on a 10-channel conventional system, a total of approximately 500 – 1,000 public safety users can be served, whereas those same 10 channels on a trunked system could serve roughly 1,200 – 1,800 users. The very largest 24 to 28 channel trunking systems can accommodate 6,000 or more users in public safety service depending on the agency mix and the acceptable level of PTT busies. Additionally, the assignment of channels in a trunked system is completely transparent to the user. Figure A5.3 illustrates an example of how a typical trunked radio system may allocate channels.

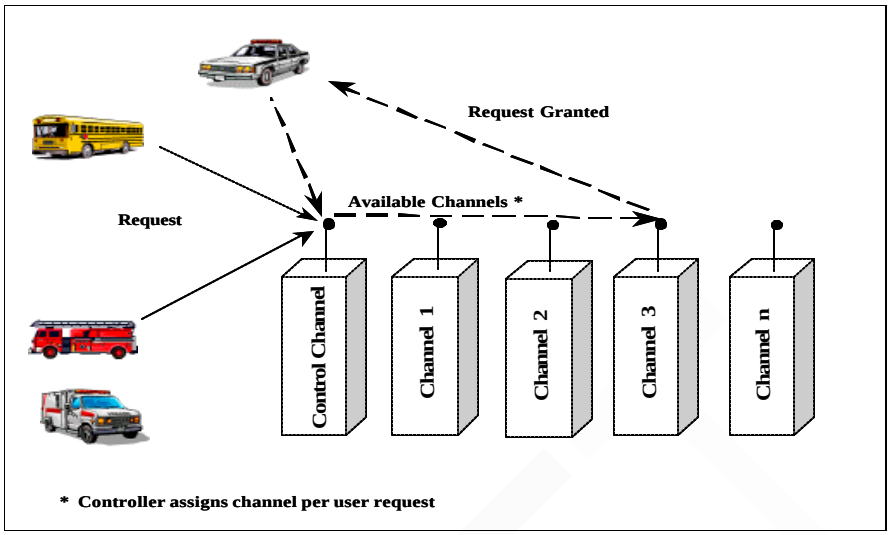


Figure A5.3 – Typical Trunking System

What is the primary difference between conventional and trunking technology? A trunked radio system allows a group of users to share a set of available frequencies. These groups of users are commonly referred to as talk groups. A talk group is a preprogrammed, predetermined basic organizational group of land mobile radio (LMR) users. In a trunked system, each subscriber unit has a unique address that corresponds to a talk group. Radio users on a trunked system have the ability to switch between talk groups by physically turning the knob on their subscriber unit to a different number. Typically, users that have similar operational, functional, and technical requirements are divided into larger segments called fleets or announcement groups. For instance, law enforcement, fire, and emergency medical services personnel are generally organized into a common announcement group and then sub-divided into functional talk groups. However, extensive planning and organizing is required to develop an effective talk group plan. Initial programming of subscriber radio equipment can be very complicated, but subsequent effort is minimized through the "radio cloning" process. If designed and implemented properly, an effective talk group plan will enhance existing system capabilities and provide flexibility over the long term.

Even though trunked radio systems are very spectrum efficient, their use has not reached a dominant position nationwide (in some regions, trunking has become dominant) because of cost and standardization. Analog trunking systems have been available from numerous vendors for over twenty years. A major drawback has been that the control channel over-the-air protocol of each vendor is different. Thus, the competition among vendors is limited. An early attempt at trunking standardization by APCO (Project 16) wasn't successful. The newer ANSI/TIA/EIA 102 (Project 25) suite of digital standards includes a control channel protocol, which covers a basic set of trunking features that all vendors can provide in their radios. Because of these standards, the competitive

landscape for narrowband digital radios is improving dramatically, which is bringing the radio costs down substantially.

The public safety radio communications network architectural elements and sub-systems presented thus far are summarized in Table A5.1 below.

Element/sub-system	Remarks
Base Station	Basic conventional system building block. Single frequency license.
Repeater	Two frequency (Pair) licensed station.
Receiver Voting	Multiple receiver sites to improve portable radio coverage.
Simulcast Transmit	Multiple synchronized transmit sites on same frequency to improve all radio coverage. Also includes receiver voting.
Multicast Transmit	Multiple transmit sites on different frequencies to improve all radio coverage. Also includes receiver voting.
Zone Transmit	Similar to Multicast, but with less voting receivers.
Trunking	Two or more frequency pairs with radio frequency assignments controlled by computer. More spectrum efficient than conventional systems. Trunking system design can utilize any of the above elements/sub-systems.

Table A5.1– Summary of Radio System Architectural Elements

Infrastructure Equipment Vendors

The common equipment necessary to design the sub-systems outlined in Table A5.1 is the base station/repeater. In this sub-section we will survey the public safety marketplace for equipment offerings from various vendors. Our intention is not an exhaustive review, but to include major vendors with their current station products. We will compare vendors with interoperability features such as Project 25 digital and narrowband capability and type of trunking protocol available. This information is summarized in Table A5.2 to follow.

Product offerings from six key vendors are included. Significant progress in the acceptance of the Project 25 digital standard for conventional operation can be noted as four of the six vendors have shipping product today. A fifth vendor, Tait Electronics Ltd., has committed to delivery of P25 conventional stations by yearend. Additionally, all of the vendor products have narrowband 12.5 KHz capability, and one repeater - the STR 3000 from Motorola, is digital narrowband only – no analog.

Progress toward implementing P25 trunking capability, however, is much more limited. Only Motorola offers infrastructure equipment that supports the basic P25 trunking standard. The remaining vendors are continuing to offer their traditional trunking system protocols. This situation exists, in our opinion,

because of the huge product engineering investment required to develop a full LMR digital trunking product line to include simulcast transmitters, voting receivers, comparators, switches, and controllers. All of these systems products are necessary to properly address the coverage and communications requirements of the public safety marketplace.

		Base Station/Repeater Interoperability Analysis Considerations										
								Encryption Specifications		TIA 102 Standards		
Vendor	Product	Frequency bands Available	Channel Spacing	Analog/ P25 Digital Capable	Transmitter Deviations Available	Emissions Designators	Conventional/ Trunking Support	Encryption Capable	OTAR Support	CAI	IMBE	DES Encryption
Daniels Electronics LTD.	VT-4 & VR-4, UT-4 & UR-4	VHF, UHF, UHF-T	12.5/25 kHz	Analog and Digital		16K0F3E, 11K0F3E,8K10F1E, 11K0F2D, 11K0F1D, 15K0F2D	Conventional Only					
EFJohnson	2600 Series	VHF, UHF, UHF-T	12.5/15/25/30 kHz	Analog and Digital		16K0F3E, 11K0F3E,8K10F1E	Conventional & Trunking (MultiNet)					
Kenwood	TKR-7400 & 8400 Series	VHF, UHF, UHF-T	12.5/15/25/30 kHz	Analog Only	+/-2.5/5	16K0F3E, 11K0F3E	Conventional Only	No	No	No	No	No
M/A-COM, Inc.	MASTR III P25	VHF, UHF, UHF-T, 800	12.5/25/30 kHz	Analog and Digital	+/-2.5/5		Conventional & Trunking (EDACS, ProVoice)	Yes	Yes			
M/A-COM Inc.	MASTR III	VHF, UHF, UHF-T, 800	12.5/25/30 kHz	Analog Only	+/-2.5/5	16K0F1D, 16K0F1E, 16K0F3E, 15K0F1D, 15K0F1E, 14K0F3E,	Conventional & Trunking (EDACS, ProVoice)					
M/A-COM, Inc.	SkyMASTR	700, 800 MHz	12.5/25 kHz	Analog and Digital			Conventional & Trunking (OpenSky)	Yes	Yes		No - AMBE	No - AES
Motorola, Inc.	Quantar	VHF, UHF, UHF-T, 800	12.5/25/30 kHz	Analog and Digital	+/- 2.5/3.6/5 kHz	16K0F3E, 16K0F1D, 20K0F1E, 11K0F3E, 8K10F1E, 10K0F1D	Conventional & Trunking (SMARTNET II, SmartZone, & ASTRO 25)	Yes	Yes	Yes	Yes	Yes
Motorola, Inc	STR 3000	700, 800 MHz	12.5 kHz	P25 Only		8K70F1E, 8K70D1W	Conventional & Trunking (ASTRO 25 Only)	Yes	Yes	Yes	Yes	Yes
Tait Electronics	8000 Series	VHF, UHF, UHF-T	12.5/20/25 kHz	Yes (end of 2004)			Conventional & Trunking (MPT 1327)					
Tait Electronics	T800 Series II	VHF, 220, UHF, UHF-T, 800	12.5/20/25/30 kHz	Analog Only	+/- 2.5/5 kHz		Conventional & Trunking (MPT 1327)					

Table A5.2 – Infrastructure Equipment Vendor Comparison

Portable Radio Interoperability Analysis Considerations																
							Encryption Specifications				Scanning Specifications		TIA 102 Standards			
Vendor	Product	Freq. bands Available	Channel Spacing	Analog/ P25 Digital Capable	Cross/ Multi-Band Support	Conventional/ Trunking Support	Encryption Capable	OTAR Support	Over-the-Air Programming	Radio-to-Radio Cloning Support	User Defined	Between Systems/Modes	CAI	IMBE	DES Encryption
Datron	Guardian G25RPV100	VHF	12.5, 25 KHz in 2.5 KHz steps	Analog & Digital	No	Conventional Only	Yes	Yes		Yes			Yes	Yes	Yes
EFJohnson	5100 Series	VHF, UHF, UHF-T, 800	12.5, 25, 30 KHz	Analog & Digital	No	Conventional & Trunking (SMARTNET II, SmartZone, ASTRO 25, and Multi-Net)	Yes (SecureNet DES, DES-XL)	Yes			Yes	Yes	Yes	Yes	Optional
EFJohnson	7700 Series		25, 30 KHz	Analog Only	No	Conventional & Trunking (SMARTNET II, SmartZone, and Multi-Net)	No	No					No	No	No
Kenwood	TK-290 & 390 Series	VHF, UHF	12.5, 15, 25, 30 KHz	Analog Only	No	Conventional Only	Yes				Yes		No	No	No
Kenwood	TK-5400	800 MHz	12.5, 25 KHz	Analog & Digital	No	Conventional & Trunking (ASTRO 25)	Yes				Yes		Yes	Yes	
M/A-COM	P7200 Series	700, 800 MHz	12.5, 25 KHz	Analog & Digital	No	Conventional & Trunking (EDACS, ProVoice, OpenSky)	Yes - DES, AES	Yes			Yes		Yes	Yes	Yes
M/A-COM	P7100IP Series	VHF, 380, UHF, UHF-T, 800	12.5, 25 KHz	Analog & Digital	No	Conventional & Trunking (EDACS, ProVoice)	Yes	Yes	Yes		Yes		Yes	Yes	Yes
M/A-COM	Jaguar 725P	VHF, UHF		Analog & Digital	No	Conventional & Trunking (EDACS, ProVoice)	No	No					Yes	Yes	No
Motorola	MTS2000	VHF, UHF, UHF-T, 800	12.5, 20, 25, 30 KHz	Analog Only	No	Conventional & Trunking (SMARTNET II & SmartZone)	Yes	No	No	Yes		Yes	No	No	Yes
Motorola	XTS5000	VHF, 380, UHF, UHF-T, 700, 800	12.5, 25, 30 KHz	Analog & Digital	No	Conventional & Trunking (SMARTNET II, SmartZone, & ASTRO 25)	Yes	Yes	No	Yes	Yes	Yes (End of 2004)	Yes	Yes	Yes
Motorola	XTS3000	VHF, UHF, UHF-T, 800	12.5, 25, 30 KHz	Analog & Digital	No	Conventional & Trunking (SMARTNET II, SmartZone, & ASTRO)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Motorola	XTS2500	VHF, UHF, UHF-T, 700, 800	12.5, 25, 30 KHz	Analog & Digital	No	Conventional & Trunking (SMARTNET II, SmartZone, & ASTRO 25)	Yes (ADP Only)	Yes	No	Yes		Yes (End of 2004)	Yes	Yes	No
Motorola	XTS1500	700, 800	12.5, 25 KHz	Analog & Digital	No	Conventional & Trunking (SMARTNET II, SmartZone & ASTRO 25)	No	No	No	Yes	Yes	No	Yes	Yes	No
Tait	5000 Series	MB, VHF, 225,380,UHF, UHF-T 800, 900	7.5, 12.5,20, 25 KHz	Analog Only (P25 by end of 2004)	No	Conventional & Trunking (MPT-1327)	No				Yes		No	No	No
THALES	Thales25	VHF	12.5, 20, 25, 30 KHz	Analog & Digital	No	Conventional Only	Yes	Yes			Yes	Yes	Yes	Yes	Yes

Vendor	Product	Mobile Radio Interoperability Analysis Considerations													
							Encryption Specifications				Scanning Specifications		TIA 102 Standards		
		Freq. bands Available	Channel Spacing	Analog/ P25 Digital Capable	Cross/ Multi-Band Support	Conventional/ Trunking Support	Encryption Capable	OTAR Support	Over-the-Air Programming	Radio-to-Radio Cloning Support	User Defined	Systems/ Modes	CAI	IMBE	DES Encryption
Datron	Guardian G25RMV100	VHF	12.5, 25 KHz	Analog & Digital	No	Conventional Only	Yes	Yes		Yes			Yes	Yes	Yes
EFJohnson	5300 Series	VHF, UHF, 800	12.5, 15, 25, 30 KHz	Analog & Digital	No	Conventional & Trunking (SMARTNET II, SmartZone, ASTRO 25, and Multi-Net)	Yes				Yes	Yes	Yes	Yes	Yes
Kenwood	TK-690, 790, 890 Series	LB, VHF, UHF, UHF-T	12.5, 15, 25, 30	Analog Only	Yes	Conventional Only	Yes				Yes		No	No	No
M/A-COM	M7100 IP Series	VHF, UHF, UHF-T, 800	12.5, 25 kHz	Analog & Digital	No	Conventional & Trunking (EDACS, ProVoice)	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes
M/A-COM	M7200 Series	700, 800 MHz	12.5, 25 kHz	Analog & Digital	No	Conventional & Trunking (EDACS, ProVoice, Open Sky)	Yes	Yes			Yes		Yes	Yes	Yes
Motorola	XTL5000	VHF, 380, UHF, UHF-T, 700, 800	12.5, 25, 30 KHz	Analog & Digital	No	Conventional & Trunking (SMARTNET II, SmartZone, & ASTRO 25)	Yes	Yes	No	Yes	Yes	Yes (end of 2004)	Yes	Yes	Yes
Motorola	XTL2500	VHF, 380, UHF, UHF-T, 700, 800	12.5, 25, 30 KHz	Analog & Digital	No	Conventional & Trunking (SMARTNET II, SmartZone, & ASTRO 25)	Yes (ADP Only)	Yes	No	Yes	Yes	Yes (end of 2004)	Yes	Yes	No
Motorola	ASTRO Spectra Plus	VHF, 380, UHF, UHF-T, 700, 800	12.5, 25, 30 KHz	Analog & Digital	No	Conventional & Trunking (SMARTNET II, SmartZone, & ASTRO 25)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Tait	T2000 Series	MB, VHF, 225,380,UHF, UHF-T,800,	12.5, 20, 25 KHz	Analog Only	No	Conventional & Trunking (MPT-1327)	Yes						No	No	No
Tait	TM8000 Series	VHF, 225,UHF, UHF-T	12.5, 20, 25 KHz	Analog Only (P25 end of 2004)	No	Conventional & Trunking (MPT-1327)	No				Yes		No	No	No

Table A5.4 - Mobile Radio Vendor Comparison

Subscriber Radio Vendors

An interoperability comparison of the major subscriber vendors can be found in Tables A5.3 and A5.4 above. Again, the information included is a relative sampling of major public safety marketplace providers. Six of the seven vendors listed have at least one digital narrowband offering and the seventh, Tait Electronics, will have a P25 portable for delivery by the end of 2004. It is obvious that the vendors foresee an increasing business in Project 25 capable radios. As a result, public safety agencies have a number of choices for radios to be used with conventional P25 communications systems.

Additionally, the competitive situation with subscriber radios is improved for P25 trunking systems. Both EF Johnson and Kenwood deliver a portable radio that operates on the Motorola ASTRO 25 trunking system. EF Johnson also ships a P25 compliant mobile radio for trunking. However, an agency must be very careful to require the vendor to thoroughly explain radio capabilities before purchase. For instance, a vendor's radio may be capable of operation on a legacy trunking system or a new Project 25 trunking system, but not simultaneously. Reprogramming of the radio may be required for operation on various types of systems and different bands.

Analysis of Cellular System Capabilities

The cellular revolution continues unabated in the United States with 88 Million units sold last year. This growth is sparked by the rollout of new innovative system and handset features. For instance more camera cell phones (24 Million) than digital cameras were purchased last year in America. The infrastructure migration to digital technologies is complete to the extent that the analog backbone will be turned off in most States this year. It is understandable that many public safety agencies look to the use of cell phones to help resolve wireless voice & data interoperability issues. NEXTEL indicates that about 20% of the company's new sales are to public safety and government markets. But agencies must understand what portable radio public safety features may be given up with the use of a cell phone.

The table below compares the availability of a number of public safety radio features among the five leading cellular service providers in the Washington region. These network and portable radio features can be taken for granted by private communications system users. However, they are very important in life and death situations. From Table A5.5 below, NEXTEL comes the closest to meeting typical public safety criteria, so we will focus on this carrier in the next few paragraphs to better understand how this came about.

Public Safety Features	Cingular[4] Wireless	NEXTEL	Verizon Wireless	Sprint	AT&T[4] Wireless
NETWORK:					
Reliability		Yes - Metrics	Yes - Metrics		
Capacity	2 % GOS	1 - 2 % GOS	2 % GOS	2 % GOS	2 % GOS
Coverage	Interstates & Major Cities	Interstates & Major Cities	Interstates & Major Cities	Interstates & Major Cities	Interstates & Major Cities
Priority Levels		Yes – Voice & Data			Yes - Data
Data	Yes	Yes	Yes	Yes	Yes - EDGE
Dispatch RF Control		Yes – Radio & Desk set			
Emergency Back-up Sites		Yes - SatCOM			
HANDSET:					
Emergency Button		Yes			
Push-to-talk		Yes – Direct Connect™	Yes		
Group Call		Yes - Group Connect™	Yes		
Talk Around		Yes – New in 2004			
GPS Location	Yes	Yes	Yes	Yes	Yes
Encryption		Yes			Yes
Data	Yes	Yes	Yes	Yes	Yes
Mil Std 810 compliance		Yes - Model r750plus			

Table A5.5 - Important Public Safety Features

The cellular wireless communication industry began in 1974 with the initial authorization from the FCC. At about the same time, the FCC created the Specialized Mobile Radio (SMR) Services. SMR was intended to be a commercial wireless service that primarily provided businesses with mobile

[4] *Cingular and AT&T are in the process of merging their corporate structures and it is expected that the network structures will be merged at some point in the future.*

dispatch communications. The first SMR became operational in 1977 and early systems utilized the Motorola, Inc. trunking architecture on 800 MHz frequencies.

As both the cellular and SMR services evolved during the 1980s the users demanded more features than just talk-and-listen. In order to meet these user needs, vendors eventually developed features based on more sophisticated digital technology. For SMR operators the digital system platform was referred to as ESMR or Enhanced SMR and was based on Motorola's Integrated Dispatch Enhanced Network (iDEN) TDMA technology.

NEXTEL began life in 1987 as an SMR operator named FleetCall. For the next ten years NEXTEL would merge with or purchase many SMR operators throughout the United States. Through this process the company came to own radio sites and 800 MHz frequencies from coast to coast in the same spectrum with public safety. By migrating to the digital ESMR trunking technology NEXTEL was able to implement wide-area systems with cellular telephony features. Today their integrated voice and data trunking system will support nationwide Direct Connect™ push-to-talk.

To complete the picture we must also know that Motorola adapted the SMR technology for public safety use in the early 1980s through the company's introduction of SmartNet trunking systems. SmartNet was the first trunking system that connected directly to a console for dispatcher control. Thus, the software evolved through the years in the separate markets meeting different standards, but with similar features. For instance, Direct Connect is equivalent to private call on a public safety trunking system.

Through this evolution the NEXTEL network today is capable of providing most, if not all, of the necessary features desired by public safety agencies. The other wireless carriers listed in Table A4.5 are also slowly enabling these desirable features. The critical areas for agencies in Washington to focus on are network capacity, reliability, and coverage. At the present time, FE does not see adequate capabilities from any of the carriers to be able to recommend any of the services as a primary Public Safety Mobile Radio solution.

Generally speaking, since wireless carriers are in business for profit, they will make network enhancements with an eye toward return on investment. Stations will not be added to cells until the Grade of Service (GOS) is measured worse than 2 percent. Infrastructure reliability and up-time metrics are collected by some wireless carriers today. However, only key sites will have battery and generator back-up in case of power failure. Cell sites will be installed in areas where customers are located not necessarily in locations where emergencies can occur. And of course, since the network is designed to be operating typically at the capacity limit for voice calls, it can quickly overload during a major disaster. While some carriers indicate that there is a prioritization plan that would favor

Public Safety subscribers in crisis situations, neither the processes nor the ability of the systems to provide this prioritization have been tested in most cases.

A less risky approach would be to utilize cellular service providers for alternative communications needs, as an adjunct to the PSMR radio system. An agency could off load some of its non-priority voice and data traffic. But these activities should be controlled through the dispatch center and properly tracked with the CAD system and voice recorders.

Computer Controller Interoperability System Approaches

One very successful method of providing interoperability to public safety radio communications systems is to link separate systems by deploying a computer controlled capability that receives a transmission on one radio system and retransmits it on a different radio system (often on a different frequency band). This is an interoperability level four strategy that can be implemented without significant additional infrastructure, and without significant modifications to the radio systems being linked. The disadvantage of this approach is that it requires a frequency (channel) to be tied up for each different radio system when in use that is part of the link. Given the relatively low cost of retransmission devices (compared to implementation of a new shared system), and the fact devices that rebroadcast can be installed with minor changes to the existing radio systems, this approach has significant potential, particularly as a near-term solution or as part of a transitional strategy. These gateway approaches can be separated into three general categories; console patch, baseband analog audio, and baseband digital/packetized audio.

Traditional Console Patch

The radio dispatch console is the central integrating element of a modern public safety communications center. Its primary purpose through the years has been to facilitate timely and accurate dispatching of emergency resources. The console provides the means by which one or more dispatchers can effectively control and communicate with field units over multiple radios. Additionally, the dispatch console seamlessly interconnects base stations, auxiliary receivers, telephones, logging recorders, paging encoders, tone encoders & decoders, intercoms, and other dispatch related equipment. The dispatch console acts as a switch that routes audio and control signals between various equipments involved in the radio system. When the console connects different audio sources together for radio interoperability, it is called “patching” the audio.

The user interface for a dispatch console can be buttons, video displays (CRTs or LCDs), or a combination of the two. A classic button-based console has dedicated buttons assigned to commonly used functions for each channel.

Channel buttons are augmented with system buttons that operate only on selected channels. Different colored LEDs adjacent to each button show system and function status. This approach provides a fast, flexible, and intuitive means of controlling the console. Installations with more than about 15 - 20 channels will have large "button fields" that must be carefully organized to avoid overwhelming the operator. Button-based consoles feature programmable buttons to allow optimization of the interface for the user's particular application.

As channel requirements have increased, many dispatch centers have transitioned to video display based consoles. This trend has been accelerated by increased public safety use of trunked radio systems and by the functional integration of the radio console with other communications center equipment. The CRT displays icons representing conventional buttons such as status, control settings, and ANI information. These icons show available actions using color, video intensity, and text. To "activate a button," the operator uses a mouse, trackball, or touch screen display. The CRT may be configured to provide controls on multiple pages arranged in a hierarchy. This allows frequently used functions and channels to be placed at the top of the hierarchy. A CRT can display a practically unlimited number of functions and channel controls. The CRT is the preferred approach for installations that employ trunked radio systems or that require a high-degree of functional integration. CRT displays not only present information in a more readily understood manner, they can also be dynamically reconfigured for specific tactical situations.

As discussed thus far the typical dispatch console has many features and options, which are utilized to control a public safety communications system. One of these features is named "console patch". Patch is a standard feature with most console vendor's equipment. Since Motorola CENTRACOM console equipment is utilized by public safety agencies throughout the State, this discussion is oriented toward that product offering.

The term "patch" originated many years ago when dispatchers were required to use "patch panels" with cables and jacks in order to connect audio circuits together. Patch is a dispatch operation, which allows audio communications between radio groups, which are normally unable to communicate with each other because they operate on different channels or talkgroups. It is a major interoperability feature of the console. This operation brings the audio together, but digital signaling messages are not distributed to the members of a patch. Radio groups can include trunking talkgroups and Private Calls (from same or different trunking systems) and base stations (which include conventional and MDC signaling base stations), and phone lines. A "Patch Group" can contain a trunking talkgroup, Private Call, Conventional, MDC Advanced Conventional, ASTRO 25 Conventional, or Phone lines. Patch operation is simplex if any channels/talkgroups in the patch are not duplex. This means the audio of the first user to key up is sent out to all other channels/talkgroups. Audio from all other subscribers is ignored until the first subscriber de-keys. If all channels/talkgroups

in the active patch support duplex, a conference call is established. All receive audio is then transmitted to all channels/talkgroups.

It is important to note that each user member is restricted to one active Patch Group. It is not possible to have a member belong to two different active Patch Groups on the same console or on different consoles. However, it is possible for the same member to be in several inactive patch groups on one or more consoles. A member may be in an active patch when another operator position activates a patch that contains that same member. In this case, the member is excluded from the 2nd patch and the operator is notified that the member is excluded. When the 1st patch is made inactive, the excluded member will not be automatically enabled. The operator has to deactivate then activate the 2nd patch to add the excluded member back in.

As can be seen console patching of many channels into many patch groups in a large dispatch center can become quite complicated. Many vendor consoles allow up to 16 patch groups to exist at any time. However, if the dispatcher is using a CRT/LCD type display position, then the organization of patch groups, using the "drag-and-drop method", is fairly straightforward and can be accommodated with minimal training. A significantly larger dispatcher training effort would be required if the console positions were of the button and LED type.

RF Gateways with Analog Baseband Audio

Over the past few years several companies have addressed the issue of utilizing RF gateway technology to interconnect radio channels. Public safety operates in ten separate radio frequency bands. Even though public safety has gained spectrum through licensing on much or their entire allocated spectrum, which has added capacity, it has also caused the fragmentation that characterizes the public safety spectrum today. In addition to the wide span of frequencies in use, systems utilize simplex operation, repeater operation, Conventional and Trunked 800 MHz operation, and NEXTEL wireless. As more wireless technologies become available to the public safety community, additional integrated and multiple solutions will become available. They must coexist with each other now as well as being backwards compatible with various previous versions of those technologies.

While exploring a potential match between system solutions and short-term goals, many manufacturers were found, which produce products that address the RF gateway solution. Several companies produce products that find their home in an incident command vehicle. This is a mobile-only application that "cross-patches" a rack of mobile radios contained inside an emergency communications van. When talking of RF gateways, some think only of the mobile RF cross patch devices used in a mobile command van application. This type of system design results in a limited radio coverage RF gateway.

This subsection of the study addresses the use of a RF interconnect system that is part of the fixed infrastructure and links radio systems with known radio coverage areas.

RF gateway technology must be, (1) easy to implement, (2) easy to maintain, and (3) easy for the PSAP or EOC dispatcher to operate in time of an emergency, (4) cost effective, and (5) take into account the ability to gateway multiple frequency bands.

The most popular product in this category comes from JPS Communications of Raleigh, North Carolina and is named the ACU-1000 Intelligent Interconnect System. The ACU-1000 modular interface / interconnect system is a computer controlled radio router that can be configured to meet almost any interface application involving telephones and radios.

The ACU-1000 is a modularized approach to controlling and interconnecting various types of communications systems. Its basic components are interface modules, each designed to connect a specific communications medium (VHF/UHF radio, telephone, HF radio, or local operator), a control module, a chassis to accommodate the modules, and a backplane to route the digitized audio and control signals between modules. Adding a new communications format to the system can be as simple as plugging in the appropriate interface module and connecting the new equipment to the ACU-1000 backplane.

The interface modules convert communications traffic into its essential elements: receive and transmit audio, and accompanying control signals required to fully control the device that the module is interfacing.

The ACU-1000 is designed for standard 19-inch rack mounting. The Euro card chassis accommodates a Power Supply Module, Control Processor Module and Handset/Speaker/Prompt Module which occupy dedicated slots, and up to twelve interface modules. An expansion chassis option is also available. The interface modules are selected based on the type of interface required.

A similar product is available from Telex/Vega named the IP-223. This unit combined with other interface modules will enable interconnection and control of two or more radios in different frequency bands. The IP-223 will also connect directly to an IP network.

Additional vendors are appearing regularly in the public safety marketplace as the need for interoperability solutions gains momentum.

Current Deployments

Currently there are over 2,100 ACU-1000 units in use around the world providing interoperability solutions. There are many success stories utilizing this device in public safety communications applications.

Approximately two years ago the State of Maryland started with one ACU-1000 to do RF gateway interconnects. Today they have over 20 units cross-linking agencies throughout the State. Since the ACU-1000 is an Ethernet based product it allows any console within their system (through memos of understanding) to access any dispatch center ACU-1000 via the Ethernet. The State of Maryland in conjunction with JPS engineers has used a WAIS (Wide Area Interoperability Software) approach to achieve this goal.

Boulder County, Colorado is using the ACU-1000 to connect disparate radio systems. The Boulder County Drug Task Force is a partnership of Denver area agencies, an area of seven counties and many municipalities, which are all working to reduce the drug problem. The agency radio systems are attached to the switching system of the ACU-1000. The dispatch center has a computer program that allows “point and click patching” or connection of various agencies. Up to seven operations can be connected simultaneously. This system was also successfully employed during the Colorado wild fire season, where it was used to patch together two fire departments using different radio systems.

Under a grant from the National institute of Justice (NIJ) a cross band audio switching system was installed at the Alexandria, VA Police Department (APD) to improve communications systems interoperability in the Washington DC area. The Gateway Sub-system is installed at APD's headquarters and includes antennas, radios, and an ACU-1000 interconnect unit. The antennas are mounted on the roof of APD, while the radios and ACU-1000 are mounted in an equipment rack (see photo at right) in the Equipment Room of the APD Dispatch Center within APD headquarters. The radios in the Gateway Subsystem are programmed for frequencies licensed to the participating agencies and typically are set to a channel programmed for a default frequency corresponding to the channel that a participating agency designates for inter-agency communications. Mutual Aid channels can also be utilized. Radio channels may be changed manually as required to transmit and receive on different frequencies.

The initial operational use of this Gateway Sub-system was in support of security for the Inauguration of President Bush. Since this initial application the sub-system has been expanded to connect with another remote ACU-1000 and now includes interoperability connections with 18 different radios to every major law enforcement agency in the metropolitan region. APD is also participating with local Fire Departments in the development of a mobile response unit, which will include an ACU-1000.

Subscriber Control

In addition to the console dispatcher controlling the RF gateway, subscribers (mobiles or portables) having DTMF encoders can also control ACU-1000. As an example let's say an RF gateway is set up as patch number "02" between the County Sheriff and the Department of Natural Resources. Any subscriber having DTMF control would send *02 to set up the link. The link prompts the user for their password, i.e., 1755, and the link is established. The link is then knocked down with a #02. As can be seen this would give personnel in the field the ability, in addition to the dispatcher, to establish interoperability connections.

The JPS ACU-1000 has been used to even link volunteer search teams using FRS radios and given them the ability to talk direct with public safety search and rescue. The combinations are nearly endless. The only real downside to this type of radio frequency patch is that they are spectrum inefficient since each participant essentially gives up one channel to each patch talk path.

Gateways with Digital Baseband Audio & Packet Switching

Interoperability solutions in this category utilize an Internet Protocol (IP) based network to link disparate radio systems together. IP is probably the most ubiquitous standard in the world of communications and computers. It's what allows dissimilar desk-top computers and software applications to communicate with each other. IP can enable the same communications capability between dissimilar radio systems.

M/A-COM NetworkFirst

Released about two years ago, the initial vendor of this network interoperability technology approach was M/A-COM Wireless Systems, and they call their solution *NetworkFirst*. It links disparate systems together through a packet-switched IP network using "SkyGate" Interoperability gateways where necessary and includes network control using M/A-COM's Network Switching Center (NSC) to provide interoperability capability. A backup NSC, which can be installed at a remote location for redundancy and reliability, is also included in the system design. The system uses commercial off-the-shelf (COTS) networking equipment such as Sun Workstations, Cisco routers, and Ethernet interface cards to provide high reliability with reasonable economy and virtually unlimited scalability in the number of users or systems that can be accommodated. The NetworkFirst SkyGate offers compatibility with any radio interface capable of providing 4-wire audio and transmit/receive control. It also provides access to the Public Switched Telephone Network (PSTN) through direct connect to a PBX or to a central office.

NetworkFirst is an interoperability solution built on IP switching instead of audio patching. IP switching enables the NSC to make switching decisions based on talk-groups, call priority, preemption, and blocking. These are features normally associated only with trunked radio systems and differentiates *NetworkFirst* from either console patch or baseband analog audio switching approaches. These features provide interoperability with greater user flexibility than either of the previous two alternatives.

A key innovation of *NetworkFirst* is that it enables public safety agencies to proactively create interoperability talk-groups for preplanned incidents while providing the flexibility to quickly create new interoperability groups as needed. As was outlined in the beginning of this section, dispatchers play a critical role in nearly all Public Safety communications. NetworkFirst enables dispatchers and appropriate field personnel to maintain their usual communications within their agency while allowing selective communications with additional agencies during interoperability situations.

Motorola, Inc. SSRN

Earlier this year, Motorola, Inc. introduced an IP based network interoperability system called the Soft Switched Radio Network (SSRN). This system utilizes distributed network architecture, based on peer-to-peer (P2P) IP based networking and industry standard Session Initiation Protocol (SIP) signaling, which creates a very robust and scalable network for Public Safety applications. Additionally, the system architecture and design incorporates extensive use of high-availability (HA) components throughout the network and results in continued system operation even with the loss of system components; i.e., overall system operation is maintained with no single point of failure.

Motorola's SSRN System utilizes a customer supplied IP backbone network, Motorola IP Gateway devices (GUs) with proprietary application software running on a real-time operating system, and standard networking components (COTS) to provide a means of networking different radio systems into one virtual network, which allows communications and interoperation across radio system boundaries. Native radio system subscribers, including radio's (VHF, UHF, 700, 800, conventional or trunked), wireless control stations, or dispatch console operators interface to SSRN Gateway Units that are connected to an IP network via standard routers, and other LAN components. The IP network provides the transport mechanism that distributes IP datagram's to multiple target destination locations depending on the specific connections that are dynamically selected by any dispatch operator in the network. SSRN GUs are soft-switching devices, that convert base-band audio of each corresponding radio subscriber or dispatch PC to IP datagram's that are then dynamically distributed though-out the SSRN network.

The SSRN also includes an Operations and Maintenance Center (OMC), which is composed of HA clustered servers that contain the system database where, for instance, all system users are registered. These servers can be located at two different geographical locations for improved reliability. The OMC provides an overview of the SSRN system and may hold emergency network configurations to be utilized at the time of a major disaster. These configurations are made up of talk groups composed of the various agency radios utilizing the different IP network interconnected analog and digital communications systems through-out a region.

Other IP Approaches

There are also some emerging systems being developed by non-PSMR companies that offer IP-based switching and connectivity using the municipal/State network and the Internet. One product, WAVE (Wide Area Voice Environment), developed by Twisted Pair Solutions, Inc. offers the ability to connect virtually any communications device to any other communications device by using software and a set of COTS hardware products. This could theoretically allow a radio in the field to connect to any other radio in the country, or more likely it can provide intercommunications between field radio units, dispatch centers, supervisory personnel, and other agencies using radios, telephones, and mobile data computers or personal computers and PDA's. As with the previous Motorola and M/A-COM solutions, this product interfaces to a radio at the 4-wire audio level and will pass transmit/receive control signaling. These solutions are relatively new but could fit well with certain operational scenarios where a broad reach of communications is necessary.

Emerging Wireless Services and Technologies

The digital revolution has prompted a flood of cell phones, pagers, personal digital assistants (PDAs) and laptop computers into consumer markets. Advances in wireless technology are enabling users of these devices to communicate without the need for cables and/or phone jacks. Wireless usage increased by 145 percent during 2003 in 13 industrialized countries according to a study conducted by the market research firm Ipsos-Insight. Principle among these new innovations is the wireless LAN type technology for home and business applications. Because of the high visibility and strong interest in these technologies a number of vendors are proposing applications for the public safety market.

Hot-spot 802.11 Wi-Fi Networks

The components for wireless LAN networks have been shipping in the consumer market place for nearly ten years. However, as with most new technologies, significant adoption didn't begin until a standard existed. In 1997, the Institute of Electrical and Electronics Engineers (IEEE) created the first WLAN standard. It

was called 802.11 after the name of the working group that developed it. This initial standard only supported a maximum bandwidth of 2 Mbps, which the early users determined was too slow for most applications.

The IEEE expanded the original 802.11 standard in 1999 into two extensions, the 802.11a for business applications and the 802.11b for home use. Sales of the 802.11b/g standard devices took off first because they used the same radio frequency band – 2.4 GHz – as the original standard. The maximum bandwidth was increased to 11 Mbps, which is comparable to traditional Ethernet. These frequencies, however, are in the Industrial, Scientific, and Medical (ISM) band, which is unregulated and congested with transmissions from many different devices including cordless phones, microwave ovens, and other appliances. This congestion makes 802.11b type WLANs more susceptible to potential interference, which must be understood during system installation.

By comparison the 802.11a standard allows for a much higher bandwidth of up to 54 Mbps along with forward error correction, greater scalability, and better interference immunity. 802.11a uses 300 MHz of spectrum in the 5 GHz Unlicensed National Information Infrastructure (U-NII) bands. While devices in the U-NII band encounter less congestion and interference than the ISM band, they also have less range because signals have more difficulty penetrating walls, trees, and other obstructions.

In mid 2003 the IEEE ratified the 802.11g standard. This standard combines the best of both the 802.11a and the 802.11b by supporting bandwidths up to 54 Mbps in the 2.4 GHz band. 802.11g is also backwards compatible with 802.11b, which means that 802.11g wireless access points (WAPs) will work with 802.11b wireless network adapters and vice versa. The maximum power output of a WAP for either standard is one watt. A comparison of the features of the 802.11 series is contained in Table A5.6 below.

Wi-Fi, short for wireless fidelity, is the industry standard for wireless technology. It is, in fact, a brand name developed by the Wi-Fi Alliance to ensure compatibility among products. Before the alliance was founded in August of 1999, WLAN system integrators encountered problems assembling products from various vendors. The Wi-Fi alliance currently has more than 200 member companies and has certified more than 1,250 products for interoperability. These products carry the Wi-Fi seal on their packaging. The Alliance keeps a listing of certified products on it's own Web site at www.wi-fi.org/certified_products.

Characteristics	802.11	802.11a	802.11b	802.11g
Application	Wireless data networking	Broadband LAN Access	Wireless data networking	Broadband LAN Access
Spectrum Band	2.4 GHz ISM	5 GHz U-NII	Unlicensed 2.4 GHz ISM	Unlicensed 2.4 GHz ISM
Modulation Scheme	FHSS or DSSS	OFDM	DSSS	OFDM or DSSS
Number of Channels	79 channels with FHSS; 3 or 6 channels with DSSS	12	3	3
Optimum Data Rates (Mbps)	2	54	11	54
Range (meters)	100	50	100+	100
Date established	July 1997	September 1999	September 1999	July 2003
Compatibility	802.11 only	802.11a only	802.11g	802.11b
Global Operability	North America, Europe, Asia	North America, Europe, Asia	North America, Europe, Asia	North America, Europe, Asia

Table A5.6 - Comparison of Characteristics Specified within the IEEE 802.11 Suite

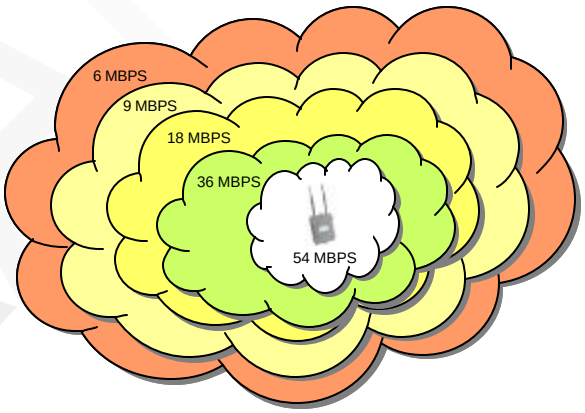
New IEEE 802.11 Standards in Process

The IEEE standards bodies are currently working on a number of new WLAN standards of interest to public safety, which are summarized in Table A5.7 below. Standard 802.11p is of particular interest to public safety in that it will define the air interface requirements for operation of vehicles in motion in the 5.9 GHz Digital Short Range Communications (DSRC) band. This new standard was requested by the Intelligent Transportation System (ITS) organization, however the IEEE working group is also receiving public safety inputs on requirements from NPSTC. The standard will be released in 2005 and will be applicable to the 2.4, 4.9, and 5 GHz bands also. The desire of the IEEE working group is that current equipment will only require a software upgrade to interoperable with this new standard.

Standard	Key Improvement	Comments
802.11n	Higher throughput (>100 Mbps)	Physical & MAC track standards revisions.
802.11p	Moving vehicle wireless access	Based on 5.9 GHz DSRC Band. Up to 200 kph speeds.
802.11r	Fast BSS transition	Reduces handoff delays.
802.11s	Mesh Networking	Developing support for multi-hop wireless networking to improve coverage & reduce installation costs.

Table A5.7 - Emerging WLAN Standards.

All of these wireless LAN standards typically operate over a range of approximately 100 meters in a business environment to a typical omni-directional access point. Although each of these standards is often referred to by their peak data rates, that data rate is typically only achieved when in a good signal area fairly close to the access point. The true data rate can be as low as 1/5 to 1/10 that speed at the edges of the coverage area or in a high interference environment. However, the data rate for a 802.11a or g WLAN is always higher than for a 802.11b WLAN at the same distance from the WAP.



It is also important to note that the throughput is always less than the data rate due to signaling overhead and contention for the bandwidth. This contention can be significant if several users are on the same wireless access point, or if the wireless LAN system is also used for back-haul (as in a mesh type network). Most wireline LAN systems have evolved from a shared medium with daisy chained cables and hubs, to an architecture with dedicated links for each terminal, terminated in a switch or router. The wireless LAN architecture maintains that older “Shared Medium” design due to its inherent nature.

Public Safety 4.9 GHz Band.

A key disadvantage of the 802.11 a, b, or g type WLAN implementations is the frequencies are in unlicensed spectrum. Thus, the potential for interference and range reduction can be fairly high. The FCC directly addressed this issue with the release of service rules for the new 4.9 GHz band in the Third Report and

Order on Docket No. 00-32 in May 2003. This new band (4940 – 4990 MHz) will support a variety of broadband applications both temporary and permanent.

The FCC purposely didn't specify an air interface standard for use in this band. However, it is expected that the 802.11g standard will be "tweaked" to utilize the 18 channels created. These channels are either 1 MHz (Qty 10) or 5 MHz (Qty 8) wide and can be aggregated up to 20 MHz of bandwidth. The rules allow a maximum total power output of 33 dBm (2 watts) per 20 MHz channel with a maximum antenna gain of 9 dBi.

Public safety agencies can apply for licenses to use the spectrum within their areas of jurisdiction. The jurisdictional areas will include all States, counties, cities, towns, municipalities, etc., and will encompass every geographical area that has an established public safety entity. All frequencies will be shared among licensees, and adjacent and co-located licensees are required to cooperate and coordinate in use of the spectrum. Public safety entities are also allowed to enter into sharing agreements or other arrangements with entities (such as power, petroleum, and railroad industries) performing operations in support of public safety.

Initially, the FCC planned for the coordination for this new band is to be done by the 700 MHz Regional Planning Committees (RPCs). The RPCs were to call an first meeting to begin planning within six months of the effective date of the rules publication. They were then to provide the FCC with a copy of their plan within twelve months of the effective date of the rules. In the event a 700 MHz RPC did not establish a plan governing coordination procedures, 4.9 GHz band licensees would not be precluded from voluntarily establishing a local 4.9 GHz planning committee, appointing one or more band managers or other coordinator(s), or implementing other procedures to facilitate effective coordination of operations in the band.

Because of the numerous inputs received the FCC issued a stay of their original Report and Order deadline dates in August 2004 with release of Order FCC 04-185. This Order provides that the deadline for submission of 4.9 GHz plans will be six months following the issuance of an Order resolving the petitions for reconsideration (discussed under the NPSTC section to follow).

Progress on the 4.9 GHz plans in the Regional Planning Committees has been slow nationwide as the RPCs currently struggle with their 700 MHz band plans. Region 43 will continue work on the 4.9 GHz band issues subsequent to completion of the 700 MHz plan in December or January.

Public safety agencies have high hopes for data communications systems in the 4.9 GHz band. The broadband wireless data communications capabilities of Wi-Fi have a huge potential for new applications at acceptable costs. The ability to "downband" the 802.11 standard into controlled spectrum is a significant plus. Public safety agencies continue to look for cost-effective, robust, secure solutions that will provide higher data transmission rates that can handle larger user data loads over wider coverage areas. Although they are functional, present private RF and commercial solutions provide a maximum throughput of about 19 kilobits per second and do not provide the bandwidth necessary for many of the emerging graphical, photographic, and biometric applications that public safety agencies desire to deploy. These applications normally require and will result in the need to transfer large amounts of data over a wireless network. Shown in Figure A5.4 is a common public safety WLAN application that could be implemented today.

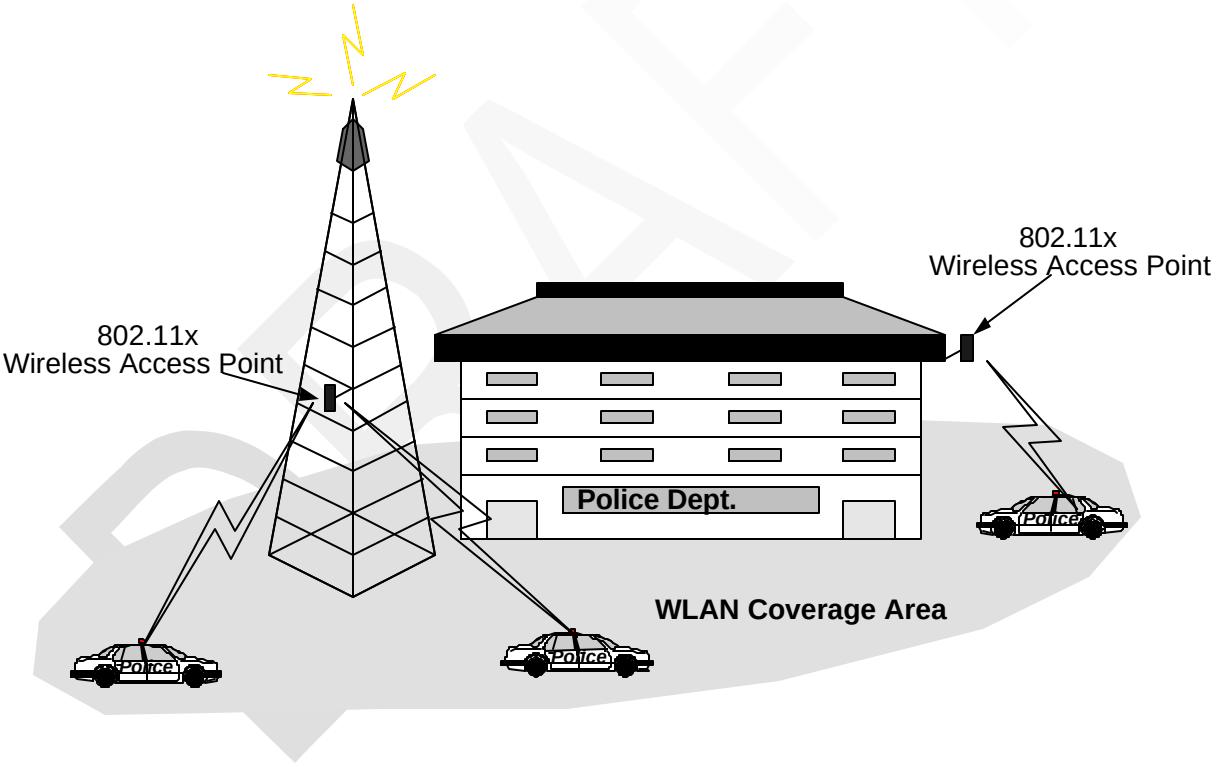


Figure A5.4 - Public Safety Scenario (Source PSWN)

These two WAPs, mounted outside the police facility, are connected to the police department's wired network via a network switch or hub. As a result the officers outside can access the department's network through the laptop computers in their vehicles with a broadband connection. This allows the police officers to upload and download necessary information to and from available applications and systems in much the same manner as if they were working at a workstation in the facility.

NPSTC Petitions to the FCC Regarding the 4.9 GHz Band.

After reviewing the FCC's Third Report and Order of Docket 00-32, the National Public Safety Telecommunications Council (NPSTC) identified three areas of concern, which it feels will impact the rollout of equipment in this new band. These three issues are:

- The FCC's adoption of an unnecessarily restrictive emission mask will add significantly to the cost of equipment, forming another niche market for public safety, and potentially cause a significant delay in the introduction of equipment.

- Provision of a totally unregulated technology area within an open licensing system that will potentially lead to technology conflicts within common coverage areas of licensees to the point that interference renders the band useless, while at the same time severely hindering interoperability.

- Failure to adopt mandatory regional planning and a conflict resolution process for disputes arising between licensees, and within and between Regional Planning Committees.

NPSTC submitted their petition for reconsideration on July 30, 2003 and the FCC hasn't as yet formally responded. The heart of the NPSTC argument is that it would like the FCC to require the 802.11 standards series be utilized in the new 4.9 GHz band along with the 802.11 emissions mask. The perspective is that vendors will only need to make a software change on their current 5 GHz equipment in order to operate in the 4.9 GHz band. Thus, public safety will reap the cost benefits of high volume production.

NPSTC, Motorola, Inc., and the Industry Coalition (Cisco Systems, Inc., Nortel Networks, Inc., etc.) have continued to submit ex parte filings to the FCC during 2004 in an attempt to reach a consensus on system design specifications. As of October they are in virtual agreement on nearly all points. Thus, the FCC may issue its Order releasing the stay by the end of the year or early 2005.

Vendor Activity in the 4.9 GHz Band

Despite the controversy surrounding the FCC rules, some vendors are moving ahead with their plans for products in the 4.9 GHz band. Motorola, Inc. has formally met with the FCC on two occasions (Dec 2003 & April 2004) and suggested that the standard 802.11 chip set can be used with only a simple external passive filter to meet the FCC emissions specifications. Motorola is moving ahead with their plans and will ship product in the 4.9 GHz range during 2005 to include a full bandwidth Hot-Spot network and a wide area roaming broadband network with through-put in the 2 – 3 Mbps range. The networks are

planned to have vehicle mobility up to 200 mph with roaming and seamless handoff.

MeshNetworks, Inc., recently acquired by Motorola, demonstrated a prototype WLAN operating in the 4.9 GHz band at the ITS America Exposition on April 26. The system utilized 802.11 type equipments and showed high resolution, full motion video. This demo also included MeshNetworks proprietary MeshConnex ad-hoc network router/repeater software. MeshNetworks intends to ship equipment in the 4.9 GHz spectrum by yearend.

Tropos Networks, Inc. also intends to have their WLAN equipment shipping in the 4.9 GHz band by early 2005. Today, Tropos equipment is designed for applications in the 2.4 GHz spectrum and they also use proprietary network software called Metro-Scale Cellular Wi-Fi with their 802.11 products. However, Tropos raises the issue that real world RF losses for signals at 4.9 GHz are much worse than at 2.4 GHz. In particular, loss due to foliage absorption can be 20 dB greater along a typical residential street. Thus, Tropos believes that their WLAN products will have significantly less range at 4.9 GHz than at 2.4 GHz. Controlled beta testing will need to be done to determine if these potential higher losses are a serious issue.

Many of the wireless broadband industry vendors will be participating in a 4.9 GHz system applications demonstration at the Los Angeles County Emergency Operations Center during the week of January 27th 2005. The objective of this event is to promote Public Safety 4.9 GHz and wireless broadband awareness and to demonstrate emergency wireless broadband scenarios. Test data will be accumulated during the demonstrations, which will help the Regional Planning Committees develop their 4.9 GHz band plan submissions to the FCC.

Longer Term Technologies

Software defined radios (SDR) have been long-proposed as the solution to most if not all interoperability issues, except two – availability and affordability! These devices, which can essentially offer software-enabled capability to talk and receive on any frequency band to any other radio, are available to the military but little progress has been made towards having them available, and affordable, for the use of Public Safety entities. ***FE*** believes that this is an important area to watch, but that there are no solutions in any reasonable timeframe that could benefit the State of Washington in developing a plan for interoperability.

Appendix 6 - Overview of FCC Regulations

Demand for radio frequency spectrum (radio channels) is increasing. While this valuable resource is, in theory, limitless, practical considerations, such as:

- The distance over which signals in different frequency ranges can be expected to reliably travel, and
- How many signals or channels can be placed in a given amount of spectrum.

These factors do, in reality, limit the number of frequency ranges that are suitable for given forms and types of communications.

For public safety agencies in the United States, the Federal Communications Commission (FCC) is chartered with defining the criteria for use of the spectrum, including frequency assignment and technical standards for equipment, all with the benefit to the public in mind.

There are several spectrum related initiatives that impact Public Safety Radio Services and interoperability presently in process at the FCC as follows.

800 MHz

The 800 MHz band has been in use for nearly 25 years, having been originally reallocated from UHF Television Channels 70 through 83. More recently, interference problems have been plaguing Public Safety users of this frequency band in major metro areas, mostly (though not exclusively) attributed to the Nextel network, which uses frequencies interspersed with those assigned to Public Safety Agencies. The “Public Safety Interference Task Force” (PSITF) was created from a FCC meeting in 2000 to develop potential solutions. A series of “Best Practices” or voluntary technical measures to prevent or reduce interference were adopted. Input was gathered from numerous Public Safety organizations and agencies, which culminated in the “Consensus Plan” for resolution. The FCC is committed to resolving this interference issue, and released its rebanding Report and Order, FCC 04-168, in August 2004.

The essential objectives of the Commission’s plan of resolution are as follows.

- Resolution of the problem of interference to Public Safety radio systems.
- Equitable treatment of all affected spectrum licensees with minimal disruption to both spectrum users and the public.

- Administration of the spectrum for the public good, exercising sound principles of spectrum management.

- The provision of additional 800 MHz spectrum that can be quickly accessed by Public Safety agencies and rapidly integrated into their existing systems.

This plan is composed of short-term elements, including "Enhanced Best practices" to reduce interference, and long-term actions, which are principally to reconfigure the 800 MHz band. NEXTEL will pay full funding of all relocation costs. To ensure a smooth transition to the new 800 MHz band plan, the relocation process will be managed by an independent Transition Administrator. The Commission requires that the band reconfiguration be completed within 36 months of release of a Public Notice announcing the start date of reconfiguration in the first NPSPAC Region, through a tracked transition process.

The degree of impact on Public Safety agencies utilizing the 800 MHz band in the State of Washington depends on their location. In the non-Canadian border areas of the State the process to move incumbents to new channels will be fairly straightforward, similar to most of the other Regions of the country. However, for agencies located in the border areas, which include over half the State's population, the process will be very complicated and require new frequency planning schemes with Canadian agencies. The rebanding coordination and planning effort could be significant, but the additional frequencies available will be a plus especially in the Puget Sound area.

700 MHz

Starting in 1997, in association with the implementation of digital technologies for Television Broadcasting to enable High Definition television broadcasts, 10 more Television channels (UHF Channels 60 through 69) are in the process of being made available for Public Safety and Commercial interests. Once the television stations presently holding licenses for those channels can be relocated, 40% of this Spectrum (24 MHz) will be allocated to Public Safety use (see Figure A6.1 below). Interoperability/mutual aid channels have been included in the band plan. The Regional Planning Commissions (RPCs) must submit their frequency usage plans to the FCC before local agencies can utilize this band. The earliest that this spectrum is likely to be nationally available for use by Public Safety is December 31, 2006, as that is the date by which UHF Television stations broadcasting in Analog mode on Channels 60 to 69 are required to have completed their transition to broadcast in Digital mode on channels below 60.

This new band is very attractive to Public Safety agency use for a number of reasons.

- The band is immediately adjacent to the current 800 MHz band, which is used by many agencies today. Expansion channels in this band could allow reuse of some infrastructure and subscriber equipment.

- The band plan includes both narrowband and wideband voice & data channels.

- A total of 2.6 MHz of spectrum has been allocated to interoperability applications.

- 2.4 MHz of spectrum is allocated to the States for their use.

746-806 MHz Band Plan

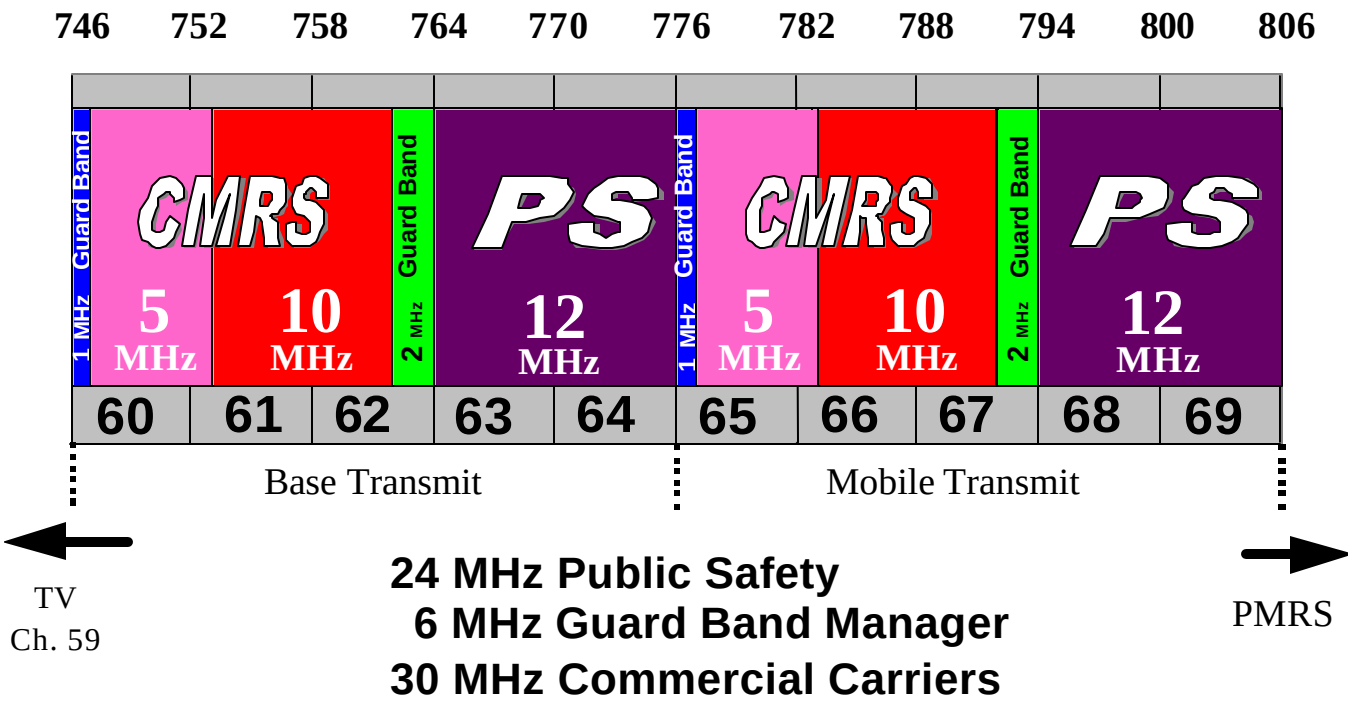


Figure A6.1 - 700 MHz Band Plan

The narrowband channeling configuration in the band is set-up with the goal of one voice/data path per 6.25 KHz of spectrum. However, the channels are assigned in 12.5 and 25 KHz blocks, which will allow vendors to utilize TDMA type technologies. One major vendor indicates data rate capability of up to 96

KHz on a 25 KHz channel. System infrastructures will be identical for voice, data, and encryption signaling. Interoperability standards have been established for both the narrowband and wideband channels, as follows.

- Narrowband channels use ANSI/TIA/EIA 102 (Project 25) Standards.
- Wideband channels use ANSI/EIA/TIA 902 (SAM) Standards.

Also, as mentioned previously, the interoperability channels have been designated in the band plan.

Washington was one of the first states to apply for and receive licenses for this frequency band. The Region 43 Planning Committee has made significant progress toward completing their 700 MHz band plan for submission to the FCC, which will include statewide requirements. The Committee has held meetings or conference calls every month during this year. Their final draft is targeted for completion and adoption at the December or January 2005 meeting after which it will be submitted to the FCC for acceptance. Only Region 5, Southern California, of the 54 Regions has completed the process to acceptance.

Actual utilization of the 700 MHz band by Public Safety agencies in the State is also impacted by the spectrum policy of Industry Canada. The Spectrum Management and Telecommunications Division has been gathering inputs since 2001 pertaining to allocations of the 746 – 806 MHz spectrum in Canada. The Division released a spectrum policy document (SP-746 MHz, Issue 1) in October 2004 entitled “Mobile Service Allocation Decision and Designation of Spectrum for Public Safety in the Frequency Band 746-806 MHz”. This document announces Industry Canada's decision to allocate the mobile service in the band 746-806 MHz in Canada on a co-primary basis with the broadcasting service, and designate some spectrum (12 MHz) for Public Safety(channels 63 and 68). Also announced is a moratorium on further TV licensing in these bands. This policy document is a positive step toward planning for the use of the frequencies in the 700 MHz band for agencies in the border areas.

VHF/UHF Narrowband Refarming

Better utilization of spectrum can also make more radio channels available. The FCC began a series of proceedings in 1992 to promote more efficient use of the radio spectrum, which has generally come to be known as the “Refarming Plan”. The ultimate goal is to achieve voice channel spacing of 6.25 and 7.5 kHz, improving from the 12.5, 15 and 25 kHz spacing in present systems. The initial focus of refarming has been the VHF High Band (nominally 150-174 MHz) and the UHF Bands (nominally 450-512 MHz) but 6.25 kHz (or 7.5 kHz) per voice channel is the ultimate goal of the FCC for all systems in all Land Mobile bands.

The VHF plan will have a significant impact on public safety agencies in Washington because of the prominent use of this band in the State. Referring to Figure A6.2 below, the "Current Channelization" diagram is typical for Washington as nearly all frequencies separated by 15 KHz are licensed somewhere in the State. Transmitter distance separations are enforced in order to reduce interference.

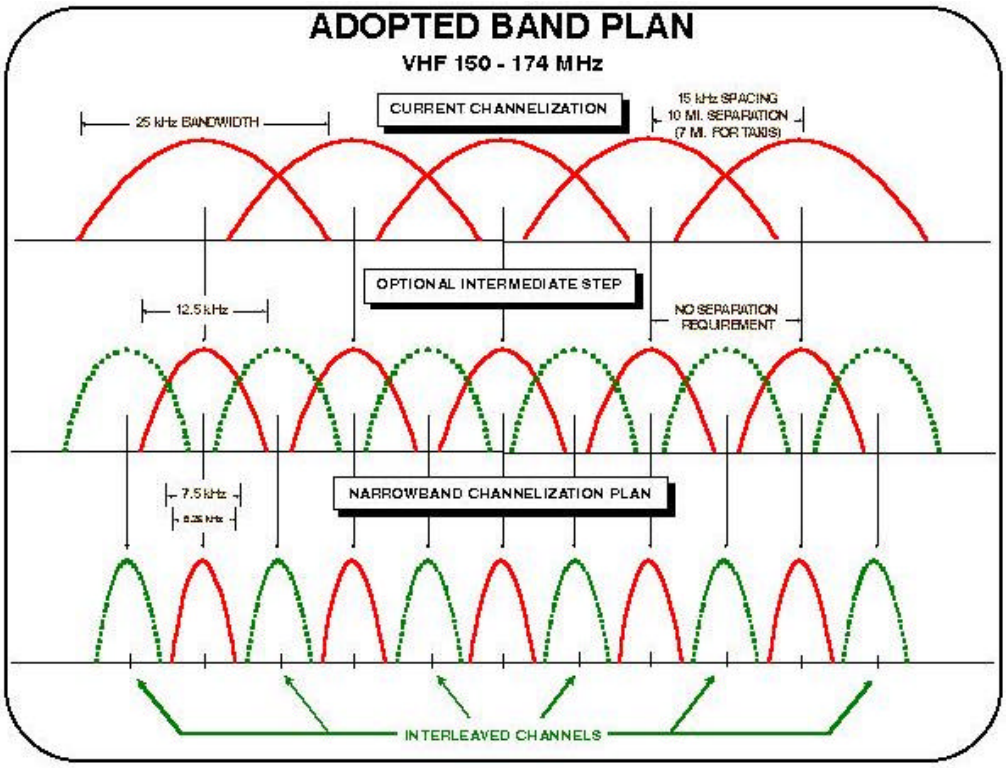


Figure A6.2 – The FCC VHF Band Plan
(Source: http://wireless.fcc.gov/services/plmrs/images/vhfband.jpg)

To meet the FCC mandate of doubling the number of available frequencies (channels) the current license holders must reduce base station and subscriber transmitter deviation by half (optional intermediate plan). This step would also reduce system range and coverage unless the equipment involved is upgraded for narrowband operation.

In December 2003 the FCC issued a "stay" of it's narrowband refarming timeline to analyze the concerns input by the public safety community. While these considerations are important, in our opinion the refarming effort will move forward as planned.

The FCC has also recognized the need for more mutual aid channels and has designated additional frequencies for this application in the traditional public safety bands.

New VHF & UHF Band Interoperability Frequencies

FCC Document 00-348 and FCC Rule CFR47 90.20 © FN 80 pertain to the new VHF & UHF nationwide interoperability channels. For reference these frequencies and current status in Washington are listed in Table A6.1 below.

Frequency – MHz	Status of frequencies in Washington
151.1375	No restrictions
154.4525	Northeast WA Restrictions
155.7525	North Central WA Restrictions
158.7375	Victoria BC Restrictions
159.4725	"A-line" Restrictions
453.2125	"A-line" Restrictions
453.4625	Vancouver BC Restrictions
453.7125	Vancouver BC Restrictions
453.8625	Vancouver BC Restrictions
458.2125	Vancouver and North Central WA Restrictions
458.4625	Vancouver BC Restrictions
458.7125	Northeast WA Restrictions
458.8625	No Restrictions – mobiles only

Table A6.1 – New Mutual Aid Channels Available (pending SIEC approval)

After December 7, 2000, any licensing of a new station for purposes other than interoperability only communications would require a waiver of Note 80 to Section 90.20 of the FCC Rules. The note States that the frequencies in question are available "primarily" for interoperability-only communications. In this context, the word "primarily" refers to the fact that stations licensed prior to December 7, 2000 may continue to operate on a "co-primary" basis until January 1, 2005.

An eligible entity must have a license to operate a base or control station on these channels. Public safety licensees who are eligible to hold a Part 90

license, or are currently licensed under Part 90, can operate mobile units on these channels without an individual license.

These channels, which are licensed on 7.5 KHz or 6.25 KHz center frequencies, are allowed to remain on a co-primary basis until January 1, 2005. Subject to the restriction that channels are currently available for interoperability use.

Since mobile units are generally licensed by rule, the problem of adjacent or co-channel interference will generally occur if a user has a base or control station licensed on these channels. Prior to January 1, 2005 interoperability use will be permitted only on a secondary basis to existing users; that is, interoperability transmissions can be made only when the channel is clear and on a non-interference basis. The only drawback until January 1, 2005 is that communications on the VHF frequencies would be secondary to existing licensees.

It would be necessary for the regional frequency coordinator to work these issues of adjacent or co-channel interference.

Appendix 7 - Glossary of Terms and Acronyms

Glossary of Terms

802.11	Wireless local area networking standards developed by the IEEE
802.11a	802.11 version that provides up to 54 Mbps throughput in the unlicensed 5 GHz band, 8 channels, the higher frequency band limits its range to about 60 feet, not compatible with 802.11b or 802.11g; also known as Wi-Fi5.
802.11b	802.11 version that provides up to 11 Mbps throughput in the unlicensed 2.4 GHz band and is backward-compatible with 802.11, the original specification, 3 channels, effective range of about 300 feet, interoperable with 802.11g; also known as Wi-Fi.
802.11g	Most recently approved version of 802.11, provides 54 Mbps throughput in the unlicensed 2.4 GHz band, and is interoperable with 802.11b, effective range of about 300 feet.
Access fee	User fee for connecting to a network, usually monthly
AES	Advanced Encryption Standard (successor of DES) will be a new Federal Information Processing Standard (FIPS) Publication that will specify a cryptographic algorithm for use by U.S. Government organizations to protect sensitive (unclassified) information. NIST also anticipates that the AES will be widely used on a voluntary basis by organizations, institutions, and individuals outside of the U.S. Government (see FIPS 140-1).
Agency	Term that applies generically to any local, state, federal entity or organization, such as; a department, division, city/town, or bureau. Includes: government, quasi-government, and private groups.
AM	Amplitude modulation, whereby transmission continuously changes the signal strength to match the voice being transmitted, susceptible to man-made (car ignition, motors, etc.) and natural (lightning storms and other atmospheric disturbances) interference sources. Not used for PS communications since the late 1940's.

Analog	Radio signal that uses continuous changes in the amplitude or frequency of a radio transmission to convey information.
Band	The spectrum between two defined limited frequencies.
Bandwidth	The capacity of a telecom line or channel to carry signals. The necessary bandwidth is the amount of spectrum required to transmit the signal without distortion or loss of information. FCC rules require suppression of the signal outside the band to prevent interference.
Base station	A fixed, land station in the land mobile service (*e.g.*, the radio located at a fire or police station that either communicates directly or through a repeater to field subscriber units).
Blocked call	Whenever there are insufficient channels to grant a communication request, usually indicated by a fast busy signal
Block grant	Federal grant funding that is allocated to state and local agencies based on a pre-determined formula.
Bluetooth	A short-range wireless communications protocol for connecting PDAs, computers, mobile phones, and accessories without cables. Range is slightly more than 30 feet and data is transmitted at 1 Mbps. Bluetooth includes device-registration and security capabilities that, for example, make sure your wireless headset works with your phone only, even if other Bluetooth phones are close by. bps Bits per second.
Cellular	Mobile/wireless telephone communications is geographically broken into relatively small cells.
Channel	A connection between initiating and terminating nodes of a circuit. A single path provided by a transmission medium via an electrical separation, such as by frequency or frequency pairs.
CDPD	Cellular Digital Packet Data, original cellular data system, being replaced by faster technologies on all digital cellular systems.
Co-channel	Interference resulting from two or more simultaneous transmissions interference on the same channel.

Collocation	Placement of multiple antennas or radio equipment at a common physical site or building.
Communications	Information transfer among or between users.
Communications Interoperability	The ability of public safety agencies to talk across agencies and jurisdictions via radio communications systems, exchanging voice and/or data with one another on demand, in real time, when needed.
Consequence Management	The ability to contain and mitigate an incident, particularly a WMD incident, including treatment of victims within a contaminated zone, their decontamination and evacuation, and local cleanup. Consequence Management also involves psychological treatment and other efforts to restore confidence in the social and economic well-being of the incident area.
Conventional	Radio system with dedicated, single-purpose channels (can be shared between several users with different operational needs; *i.e.,* fire and police), user must select the specific channel to be used.
Coverage	The geographic area included within the range of a wireless radio system.
Cross-band	A repeater that receives in one frequency band and retransmits in a repeater second frequency band; (see repeater).
Cycle	One complete performance of a vibration, electrical oscillation, current alternation, or other periodic process.
DES	Data Encryption Standard is a widely-used method of data encryption using a private (secret) key. There are 72,000,000,000,000,000 (72 quadrillion) or more possible encryption keys that can be used. For each given message, the key is chosen at random from among this enormous number of keys. Like other private key cryptographic methods, both the sender and the receiver must know and use the same private key. DES applies a 56-bit key to each 64-bit block of data. The process can run in several modes and involves 16 rounds or operations. Although this is considered "strong" encryption, many companies use "triple DES", which applies three keys in succession. DES

	originated at IBM in 1977 and was adopted by the U.S. Department of Defense. Since there is some concern that the encryption algorithm will remain relatively unbreakable, NIST has indicated DES will not be recertified as a standard and submissions for its replacement are being accepted. The next standard will be known as the Advanced Encryption Standard (AES).
Dead spot	Geographic area within the normal coverage envelope where signals are below specification for minimal quality (also: blind spot).
Digital	Radio transmission method, replacing analog FM systems, that transmits binary 1's and 0's much like a computer. Generally digital signals can travel greater distances (better coverage), however once the signal levels are below minimum no communications are possible. As data is normally digital, data transmissions are very compatible with digital radios. Digital radios are generally small and consume significantly less power (longer battery life) than FM radios.
Discretionary grant	Federal grant funding distributed at the discretion of the agency administering the program funding, usually through a competitive process.
Dropped call	Radio call that is unintentionally discounted due to a system problem, lack of channel availability, or dead spot in coverage.
Dual band	Radio equipment that operates on two frequency bands.
Dual mode	Radio equipment that operates on both analog and digital networks.
Encryption	Encoding (and decoding) “scrambling” of transmissions to provide secure/private communications that can only be unlocked by the intended/authorized recipient(s).
FEClientNet	Federal Engineering’s Internet web-based customer interactive URL.
FIPS 140-1	Federal Information Processing Standard, U.S. government standard for implementations of cryptographic modules, that is, hardware or software that encrypts and decrypts data or performs other cryptographic operations (such as creating or verifying digital signatures). The FIPS 140-1 standard was

created by the National Institute of Standards and Technology (NIST); it specifies requirements for the proper design and implementation of products that do cryptography.

First responders Individuals who are responsible for the protection of live and property, normally the first professionals called to an incident or emergency, which provide immediate support services during prevention, response, and recovery operations.

FM Frequency modulation, whereby the transmission is constant in signal strength, but the center frequency varies in proportion to the voice being transmitted, eliminates most interference sources. Used for PS communications since 1940's replacing AM - now being replaced by digital modulation. Note FM gradually fades away as signal strength is reduced by distance from the transmitter.

Formula grant Federal grant that is allocated based on a predetermined statutory formula.

Frequency The number of cycles or events of a periodic process in a unit of time.

Frequency bands The spectrum of transmission space where mobile radio systems operate in the United States. They are (from low-high):

High HF	25-29.99 MHz
Low VHF	30-50 MHz
High VHF	150-174 MHz
Low UHF	450-470 MHz
UHF TV Sharing	470-512 MHz
700 MHz	764-776 & 7940806 MHz
800 MHz	806-869 MHz
2.4 GHz	
4.9 GHz	

Frequency reuse Ability of channels/frequencies assigned to one location to be used again in another area with enough distance between them to prevent interference from affecting service quality.

Full duplex Mode of operation where the equipment is simultaneously transmitting and receiving, as in conventional or cellular phones. Requires two frequencies to create one channel. Generally not used in LMR systems.

Gateway	A device that can transparently interconnect radio audio paths so that agencies can patch into each other's radio channels in real time. This can be done at the baseband level or using IP. A gateway provides interconnection between two networks with different communications protocols.
GPS	Global Positioning System, a U.S. satellite system that lets persons/systems determine their position with extreme accuracy using GPS receivers, used by AVL technologies.
Grants	Funding made available to local agencies from State and Federal government agencies, as well as from private sources such as foundations.
Half duplex	Mode of operation where the equipment transmits then receives over a single frequency allowing two-way communication, as in PSMC repeaters, base stations, mobile and portable units.
Handoff	Process that automatically switches a user from the original tower site to an adjacent site with better signal quality.
ICS	Incident Command System, combination of facilities equipment, personnel, procedures, and communications operating with a common organizational structure, with responsibility for the management of assigned resources to effectively accomplish stated objectives pertaining to an incident.
Infrastructure	The hardware and software needed to complete and maintain a radio communications system.
Interference	Extraneous energy, from natural or man-made sources, that impedes the reception of desired signals.
Interoperability	Ability of public safety personnel to communicate by radio with staff from other agencies, on demand and in real time.
Interoperability Coordinator	An individual or individuals tasked with bringing together issues, solutions, policies, plans, and strategies relative to communications operability. The position focuses on improving interoperability communications at the local, State, and Federal levels of government.

Jurisdiction	The geographic territory where authority and operations are exercised.
Land mobile	A public or private radio service providing two-way communication, service paging and radio signaling on land.
Modem	An acronym for modulator/demodulator, which is a device that translates digital signals coming from a computer into analog signals that can be transmitted over standard telephone lines. The modem also translates the analog signals back into digital signals that a computer can understand.
Modular	Generic name for baseband cross-connect systems (similar to the interconnect ACU-1000), a.k.a. Intelligent Interconnect Systems system
Mutual aid	Generally describes a situation where a major emergency or incident requires a large number of agencies, including agencies from remote locations, working together to mitigate the crisis.
Mutual aid channel	A radio channel specifically allocated for use during emergency mutual aid situations.
Narrowband	In LMR systems, the FCC has specified reducing channel bandwidth usage from 25 kHz to 12.5 kHz, thereby doubling the number of available channels. Narrowband operations will be mandatory by January 1, 2018, when all public safety users must cease operation of wideband equipment on or before that date. (see refarming).
NCIC	National Crime Information Center (national database of crime and criminal information operated by the FBI).
Network Topologies	The shape of a local-area network (LAN) or other communications system. Topologies are either *physical* or *logical*.
P25	APCO Project 25, digital radio interoperability standard (developed primarily by Motorola), adopted by Federal government agencies, many law enforcement/public safety agencies, and all users of the 700 MHz band. After a slow start, now followed by most LMR manufacturers. Still developing with some incompatibility issues. The Phase I

	standard has been complete since October 1995, Phase II will extend Phase I standards into 6.25 kHz channels and TDMA transmission. Goals of Project 25: interoperability (greater safety and productivity with enhanced mutual aid), choices (suppliers), longevity (of technology/equipment), flexibility (to expand as resources and needs require), and economy (towards competitive sources)
Paging system	Usually a one-way mobile radio system or service whereby a user carries a small, lightweight miniature radio receiver capable of responding to coded signals. These devices, called "pagers," emit an audible signal, vibrate, or display text messages when activated by an incoming signal. Two-way pagers are also available that allow the user to respond with a simple acknowledgment or send text messages.
Path	In communications systems a route between any two points. In radio communications, the route that (a) lies between a transmitter and a receiver and (b) may consist of two or more concatenated links. Note: Examples of paths are line-of-sight paths and ionospheric paths.
PBX	Private Branch eXchange, a small telephone or voice switch that routes or interconnects voice traffic between consoles, repeaters, base stations and/or telephone lines.
PCS	Personal Communications Service, any of several types of wireless, voice and/or data communications systems, typically incorporating digital technology, uses the 1900 MHz band. PCS licenses are most often used to provide services similar to advanced cellular mobile or paging services. However, PCS can also be used to provide other wireless communications services, including services that allow people to place and receive communications while away from their home or office, as well as wireless communications to homes, office buildings and other fixed locations.
PS spectrum	Specific bands of frequencies set aside by the FCC for use by public safety agencies. They are: Low Band (25-50 MHz), VHF High Band (150-174 MHz), 220 Band (220-222 MHz), UHF Band (450-470 MHz), 700 Band (764-776 and 794-806 MHz), 800 Band (806-824 and 851-869 MHz) and 4.9 GHz Band.

Receiver	The component(s) of a radio device that converts the radio waves into audible signals.
Refarming	FCC term to promote more efficient use of PLMR services that requires reduced channel bandwidth (from 25 kHz to 12.5 kHz) to create additional communications paths or channels on frequencies below 512 MHz. Mandatory refarming date is now set for January 1, 2018 to operate ***only*** narrowband equipment. The FCC is also considering a second bandwidth reduction (to 6.25 kHz), for a date yet to be determined.
Repeater	Special receiver/transmitter combination that receives a signal on one frequency and retransmits a new signal on another frequency, usually within the same frequency band, sometimes referred to as a relay station.
Roaming	Use of a wireless phone or PSMC equipment outside of the "home" service area defined by a service provider or system. Allows a user to travel statewide and communicate as if they were still in within their local area.
Satellite	Radio relay station (repeater) that orbits the earth. A complete satellite communications system also includes earth stations (and portables/mobiles) that communicate with each other via the satellite. The satellite receives a signal transmitted by an originating earth station and retransmits that signal to the destination earth station(s)/receiver(s). Satellites are used to transmit telephone, television and data signals originated by common carriers, broadcasters, distributors of cable TV program material and for PSMC use into areas of coverage dead spots.
Satellite phone	Wireless phone that uses mobile satellite services to communicate where PSMC or cellular coverage is poor.
Satellite receiver	(see voting receiver).
Scanner	Radio receiver (and sometimes transmitter) that moves across a wide range of radio frequencies and allows users to listen (and then transmit) on any of the licensed/authorized frequency.
Simplex	One-way communications (*i.e.*, public address or broadcast systems).

Simulcast	Signaling technique that transmits the same signal from multiple sites.
SMR	Specialized Mobile Radio, a dispatch radio and interconnect service for business, using 220 MHz, 800 MHz, and 900 MHz bands.
Spectrum	The range of electromagnetic radio frequencies used in the transmission of sound, data and television.
Spectrum allocation	Federal government designation of a range of frequencies (frequency bands) for a category of use(s). For example, the FCC allocated the 1900 MHz band for PCS. Spectrum demand and new technologies can shift existing allocations. The UHF-T and 700 MHz bands were created by removing broadcast television from these frequencies.
Spread spectrum	Jam resistant technology that "spreads" information over a wider bandwidth than is necessary that provides interference tolerance, originally devised for military use.
Subscriber	User, customer on a network
Subscriber unit	User's equipment (usually a mobile or portable radio).
T1	Digital circuit at 1.544 Mbps, capable of 24 DS-0s (non-compressed voice channels), data, video, or any combination (see DS-1).
Talk group	Users assigned to a specific group that normally communicate with each other. Primarily preprogrammed into a trunk system, but can be assigned on-the-fly to add other users to interoperate with the group during emergencies or joint operations.
TCP/IP	Transmission Control Protocol/Internet Protocol, a suite of protocols (standards) for digital transmissions, originally developed by DOD. Used on most networks *e.g.*, email and web browsing are two of the more common uses.
Terminal unit	User's equipment (usually a mobile or portable radio).
Transceiver	Combination transmitter and receiver, PSMC base stations, mobiles and portables are examples.

Trunked	Radio system with a group of channels available and assigned as needed to specific "groups" or uses. All channels are automatically system assigned while in-use, then released for other users. Maximizes traffic in a minimum number of channels. FCC preferred method of operation (especially for new systems).
Turnkey	Entire system with hardware and software assembled and installed by a vendor and sold as a package.
UHF	Ultra High Frequency, the part of the radio spectrum from 300 to 3000 MHz, which includes broadcast TV Channels 14 and higher, lower frequency microwave and some marine, aviation and land mobile services.
UHF PS	Band Frequencies between 450 and 470 MHz for public safety use.
VHF	Very High Frequency, the part of the radio spectrum from 30 to 300 MHz, which includes broadcast TV Channels 2-13, the FM broadcast band and some marine, aviation and land mobile services.
VHF Hi Band	Frequencies between 150 and 174 MHz.
VHF Lo Band	Frequencies between 25 and 50 MHz, also known as Low Band.
Vocoder	A device that breaks speech patterns into components, allowing them to be re-transmitted efficiently over a narrow bandwidth.
Voting receiver	Multiple remote receivers tied together through a comparator device at a transmitter site to improve portable coverage, signal strength is compared from each receiver, and the best receiver becomes the receiver during a specific transmission. Also called a satellite receiver.
Wi-Fi	Wireless Fidelity, common name for IEEE 802.11b wireless LAN standard using 2.4 GHz frequencies.
Wi-Fi5	Wireless Fidelity 5, common name for IEEE 802.11a wireless LAN standard using 5 GHz frequencies, not compatible with Wi-Fi.

Wideband	In LMR systems, most channels are of 25 kHz bandwidth for voice communications.

Glossary of Acronyms

AES	Advanced Encryption Standard (successor of DES)
AG	Adjutant General (also TAG)
AM	Amplitude Modulation
ANSI	American National Standards Institute
APCO	Association of Public-Safety Communications Officials
AVL	Automatic Vehicle Location
AWC	Association of Washington Cities (WA)
BER	Bit Error Rate
CAD	Computer-Aided Dispatch
CAI	Common Air Interfaces
CBRNE	Chemical, Biological, Radiological, Nuclear, Explosive
CDPD	Cellular Digital Packet Data
CIP	Critical Infrastructure Protection
COTS	Computer Off The Shelf
dB	Decibel
dBm	Decibel referenced to one milliwatt. (zero dBm)
dBw	Decibel referenced to one watt. Zero dBw equals one watt.
DEA	Drug Enforcement Agency (federal)
DEQ	Department of Environmental Quality (federal)
DES	Data Encryption Standard
DHS	Department of Homeland Security (federal)
DIS	Department of Information Services (WA)
DEM	Department of Emergency Management (WA) also EMD
DNR	Department of Natural Resources (WA)
DOD	Department of Defense
DOJ	Department of Justice (federal)
DOT	Department of Transportation (federal)
EDACS	Enhanced Digital Access Communications System
EIA	Electronic Industries Alliance (publisher of Standards)
EMA	Emergency Management Agency
EMD	Emergency Management Division (WA) of WSMD
EMS	Emergency Medical Service
EOC	Emergency Operations Center
FBI	Federal Bureau of Investigation
FCC	Federal Communications Commission
FDMA	Frequency Division Multiple Access
FE	Federal Engineering, Inc. (the consultant on the Washington communications interoperability project).
FEMA	Federal Emergency Management Agency
FIPS	Federal Information Processing Standard
FM	Frequency Modulation
GHz	GigaHertz (1,000,000,000 Hz)
GIS	Geographical Information System

GPS	Global Positioning System
GUI	Graphical User Interface
HAZMAT	Hazardous Materials
HP	Highway Patrol
HSGP	Homeland Security Grant Program
Hz	Hertz (same as cycles per second)
ICRI	Interoperable Communications Radio Interface
ICS	Incident Command System
IEEE	Institute of Electrical and Electronics Engineers
IP	Internet Protocol
ISB	Information Systems Bureau (WA)
IT	Information Technology
IWN	Integrated Wireless Network
Kbps	Kilobits per second
kHz	Kilohertz (1000 Hz)
kW	Kilowatts
LAN	Local Area Network
LE	Law Enforcement
LERN	Law Enforcement Radio Network
LETPP	Law Enforcement Terrorism Protection Program
LMR	Land Mobile Radio
MA	Mutual Aid
Mbps	Megabits per second
MDC	Mobile Data Computer
MDT	Mobile Data Terminal
MHz	Megahertz (1,000,000 Hz)
MOU	Memorandum of Understanding
MW	Megawatt
NAD	North American Datum
NASTD	National Association of State Telecommunications Directors
NCC	National Coordination Committee
NCIC	National Crime Information Center
NIJ	National Institute of Justice, part of NLECTC
NIMS	National Incident Management System
NIST	National Institute of Standards and Technology
NTFI	National Task Force on Interoperability
NTIA	National Telecommunications and Information Administration (part of Department of Commerce - coordinates use of the federal government frequency spectrum).
ODP	Office of Domestic Preparedness (DHS)
OSSCR	On Scene Command and Control Radio Network
P25	APCO Project 25
PBX	Private Branch eXchange
PD	Police Department
PDA	Personal Data Assistant
PLMR	Private Land Mobile Radio

PS	Public Safety
PSAP	Public Safety Answering Point, usually a 9-1-1 call center
PSMR	Public Safety Mobile Radio
PSTN	Public Switched Telephone Network
PSSP	Public Safety Service (or Support) Provider
PSWAC	Public Safety Wireless Advisory Committee
PSWN	Public Safety Wireless Network
PTT	Push-To-Talk
REDNET	Washington State Fire Service Mutual Aid Network
RF	Radio Frequency
RFI	Radio Frequency Interference (or Request For Information)
RFP	Request For Proposal
SAA	State Administrative Authority
SAFE	SIEC Advisory Funding Enterprise (work group)
SAFECOM	Safe Communications
SAW	SIEC Advisory Workgroup
SDO	Standards Development Organization
SDR	Software Defined Radio
SEMA	State Emergency Management Agency
SHSGP	State Homeland Security Grant Program
SHSS	State Homeland Security Strategy
SIEC	Statewide Interoperability Executive Committee
SMR	Specialized Mobile Radio
SOP	Standard Operating Procedure
TAG	The Adjutant General
TCP/IP	Transmission Control Protocol/Internet Protocol
TDMA	Time Division Multiple Access
TETRA	Terrestrial Trunked Radio
TFM	Technical and Frequency Management (working group)
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance
UASI	Urban Area Security Initiative
UHF	Ultra High Frequency
UPS	Uninterruptible Power Supply
USCG	United States Coast Guard
USF&WS	United States Fish and Wildlife Service
USFS	United States Forest Service
VHF	Very High Frequency
VoIP	Voice over Internet Protocol
VOX	Voice Operated Transmit (push-to-talk not necessary)
WA	Washington
WASPC	Washington Association of Sheriffs and Police Chiefs
Wi-Fi	Wireless Fidelity
WMD	Weapons of Mass Destruction
WSAC	Washington State Association of Counties
WSDOT	Washington Department of Transportation

WSFCA	Washington State Fire Chiefs Association
WSFD	Washington State Forestry Division
WSMD	Washington State Military Department
WSP	Washington State Patrol
WTB	Wireless Telecommunications Bureau, part of the FCC

Appendix 8 - SIEC Documents

The Washington SIEC web page is http://siec.wa.gov . The following information can be found on this site:

SIEC Vision:

Public safety officials throughout Washington are able to communicate using interoperable technology in real time and on demand.

For purposes of the SIEC vision the following terms are defined as:

Real time: There should be no noticeable delay between the time information is sent and when it is received.

On demand: Immediately available when mission requires. Must be available under any circumstances.

SIEC Mission Statement:

In the interests of public safety, the State Interoperability Executive Committee (SIEC) pursues and promotes statewide interoperability policies and standards, which will ensure interoperable emergency communications.

For the purposes of the SIEC mission, interoperability is defined as: An essential communication link within public safety and public service communications systems that permits units from two or more different entities to interact with one another and to exchange information according to a prescribed method in order to achieve predictable results.

Duties and Responsibilities of the SIEC

The SIEC is responsible for the following:

- Develop policies and make recommendations to the Information Services Board (ISB) for technical standards for state wireless radio communications systems. The standards must address, among other things, the interoperability of systems, taking into account both existing and future systems and technologies.
- Coordinate and manage on behalf of the ISB the licensing and use of state-designated and state-licensed radio frequencies, and serve as point of contact with the Federal Communications Commission on matters relating to allocation, use, and licensing of radio spectrum.

- Seek support, including possible federal or other funding, for state-sponsored wireless communications systems.
- Develop recommendations for legislation that may be required to promote interoperability of state wireless communications systems.
- Foster cooperation and coordination among public safety and emergency response organizations.
- Work with wireless communications groups and associations to ensure interoperability among all public safety and emergency response wireless communications systems.
- Perform other duties as assigned by the ISB to promote interoperability of wireless communications systems.

Specific Milestones and Responsibilities:

To assist the SIEC in its duties, the legislation specifies specific milestones, which are:

- By December 31, 2003, the SIEC must complete an inventory of all state-operated public safety communications systems. By this date, the SIEC must report to the ISB and to the appropriate state legislative committees the results of such a survey.
- By March 31, 2004, the SIEC must complete an interim statewide public safety communications plan. This plan must be submitted to the ISB and sent to the appropriate state Legislative committees.
- By July 31, 2004, the SIEC must complete an inventory of all public safety communications systems within the State of Washington. This survey must be submitted to the ISB before being sent to the state legislature.
- By December 31, 2004 the SIEC must complete a final statewide public safety communications plan.